CREDIT RATIONING AND THE ECONOMICS OF INFORMAL LENDING: THEORETICAL RESULTS AND ECONOMETRIC INFERENCES USING THE HOUSEHOLD SURVEYS FROM CHINA AND INDIA

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Informal lending and borrowing among close acquaintances such as relatives and friends have been found to be widely prevalent in the rural areas of developing economies, which appears to be a less explored area. This dissertation's main objective is to investigate various pertinent economic issues related with such informal financial transactions. Furthermore, the analytical results are empirically investigated using household survey data from China and India and using appropriate econometric methods and identification strategies.

As credit rationing in the formal credit market is one of the important factors that compel these families to engage in informal lending and borrowing, important issues related with this matter has been investigated in detail and useful findings are made.

The survey data also reveals that the families in these areas face various types of risks and uncertainties. In absence of adequate access to credit and insurance arrangements often these families enter into mutual risk sharing insurance and credit arrangements.

It has been observed that in both the countries more than 70 percent and 90 percent families have engaged in gift and loan transactions respectively in emergencies. This demonstrates that people do share risk on a large scale and moreover preference for loan transaction dominates.

This dissertation makes key contribution in exploring the significance of underlying motives for these informal financial transactions. Particularly the significance of

various social preferences, apart from risk sharing motive which is exclusively driven by the material gain considerations, has been highlighted. Among these the investigation of the fairness reciprocity, in terms of fairness equilibrium framework (Rabin, 1993), as an important motive underlying the informal financial transactions among relatives and friends, supplements the existing knowledge in this field.

Analytical results are obtained to explain the informal borrowing and lending as a mutual-max fairness equilibrium outcome. However mixed evidences are obtained for mutual-max and mutual-min reciprocity. In totality Rabin's model of fairness and reciprocity when applied to explain the informal lending and borrowing is not adequate but this seems to be an excellent starting place to incorporate social preferences for explaining the informal lending and borrowing among relatives and friends.

BIOGRAPHICAL SKETCH

Chandra Shekhar Kumar was born on January 10, 1969 in Ranchi, India. He obtained his B.Tech. degree (1990) in Civil Engineering from Indian Institute of Technology, Bombay, India. He joined Indian Adminstrative Service (I.A.S.) in the year 1992 and allotted Orissa state for working. This job provided him an opportunity to work in the field, particularly related with the rural development and poverty alleviation programs. Such an exposure encouraged him to undertake higher studies in the subjects related to the development and economics.

Chandra joined the MPA/ID Program in Harvard University, U.S.A. in Fall 2002 and he successfully completed the program in 2004. His second year policy analysis paper was entitled: “Insuring the Poor People: Expansion of Health Insurance in Rural India”.

In Fall 2006, Chandra entered the Applied Economics and Management Ph.D. program at Cornell University, U.S.A. Pursuing his research interests related to the economic development issues of developing countries, he wrote this dissertation.

to my parents

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I dedicate this dissertation to my parents, Sita Devi and late Phuldeo Narayan as a token of my appreciation for their invaluable sacrifice and contribution.

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Chapter 1: Motivation, Introduction, and Objectives of the Dissertation

1.1. Motivation

The motivation of this dissertation roots in my preliminary discussion with Prof. Calum Turvey in the beginning of fall 2007, with an interest to work in the area of microfinance and micro insurance. I wrote my policy paper on the issues related to health insurance of people in rural areas during my MPA/ID program at Harvard and so was keen to expand along those lines.

As he was working on a survey data from China, he found that more than 60% of the households have engaged in borrowing and lending with their family relatives and friends. Even such large extent of informal financial transactions may be crowding out the borrowing of lending of formal institutions such as banks and rural credit cooperatives. Also there may be possibility of crowding out of financial transactions handled by microfinance institutions if the underlying forces of informal lending and borrowing are quite strong. Some of the related issues are discussed in length in Turvey and Kong (2007).

There is a growing volume of literature on microfinance, but the study of economic significance of informal lending in developing economies appears to be a less explored area. I found this area of research quite fresh and challenging. That encouraged me to work on the economics of informal lending. And that's how this dissertation started taking shape. I am thankful to Prof. Turvey for introducing me to this field of inquiry.

1.2. Introduction

In order to understand the mechanics of informal lending, it's essential to first understand the fundamentals of credit delivery operations of formal lending institutions such as banks and rural credit cooperatives. Here I was introduced by Prof. Turvey to the seminal paper of Stiglitz and Weiss (1981) on credit rationing. Building on that and researching in this field Chapter 3 presents a detailed discussion on credit rationing and presents an illustrative model of credit rationing, which generates useful results. Further, using the household survey data from China and India (discussed in the next chapter), this analysis helps in understanding the significance of various factors that are associated with credit rationing in the formal credit market in the rural areas of developing countries. Also this analysis helps in estimating the extent of credit rationing in these areas.

The obvious question is why issues related to credit rationing and informal lending should interest us. How the nonavailablility of credit or inadequate access to credit affects the livelihood of people. Hence Chapter 4 attempts to analyze the impacts of credit rationing on the livelihood of people in the rural areas of developing economies.

Now the question arises as to how farm households respond to the exigencies of credit rationing. It is also well studied that families in rural areas of developing countries face various types of risks and uncertainties. Well functioning credit and insurance markets usually enable people to face these risks and uncertainties in the developed countries. However, as investigated in Chapter 3, it is evident that a large proportion of people in the rural areas of developing countries face credit rationing as well as limited access to insurance markets. Consrquently they resort to various types of risk mitigation mechanisms. It is important to investigate these issues in order to provide helpful insights on risk sharing and consumption smoothing motivations and mechanisms of these families. These issues are investigated in Chapter 5. The three

important mechanisms analyzed are – precautionary savings, risk sharing informal insurance and credit transactions. The household survey data from China and India provide significant inferences on the analytical results.

Working on these building blocks, it is now the right time to address the issues related to the central theme of this dissertation i.e. the economics of informal lending. Apparently it is a response mechanism that the credit rationed people resort to satisfy their demands of credit needs. Also it may be the preferred way of arranging credits by some people. Also chapter 5 highlights the role of risk sharing informal credit transactions as one of the risk management mechanisms. Hence Chapter 6 is developed to understand the mechanics of such informal lending and borrowing. It attempts to analyze the underlying forces that sustain the informal lending practices in the rural areas of developing economies. Risk sharing motive has been proposed to be one of the important explanations that sustain informal financial transaction among relatives and friends. Pursuing that line of research, a detail analysis of the risk sharing motive for informal financial transactions is presented, and useful results are obtained. The primary contribution of this chapter is to characterize the loan amount, state contingent repayments, and default rates in equilibrium. Also a simple test is suggested in the chapter to get inferences on risk sharing motives. Further, these results are empirically tested using household survey data from China and India. Significant evidence is obtained that relates to risk sharing motives to explain informal lending and borrowing.

However the risk sharing motive does not include social preferences such as altruism, trust, reciprocity and fairness, which seem to be important for these financial transactions. At least from a theoretical point of view a major contribution of this dissertation is the filling of the gap between theory and observations. Fairness is found to be an important motive underlying the informal financial transactions among

relatives and friends. This analysis is presented in Chapter 7. Using the fairness equilibrium framework proposed by Rabin (1993), important results are obtained, which explain informal borrowing and lending as mutual-max fairness equilibrium outcome. Here outcomes are mutual –max when each person maximizes the other's material payoffs and mutual-min when each person minimizes the other's payoff. Analytical results are obtained to explain the informal borrowing and lending as mutual-max fairness equilibrium outcome. These results are empirically tested using household survey data from China and India. In these surveys, specific questions were asked to respondents that would reveal whether the families have preferences for mutual-max or mutual-min social interactions. Overall about 75 percent families in China (65 percent in India) demonstrate preferences for mutual-max reciprocation, whereas these percentages for mutual-min reciprocation are respectively about 40 percent and 50 percent for China and India. These findings suggest that mutual-max equilibrium is more likely to evolve in the fairness equilibrium context and it may be an important explanation of informal loan transactions among friends and relatives. These findings supplement our understanding about the underlying motives that can explain informal financial transactions among friends and relatives in the rural areas of developing countries.

In this dissertation analytical results are obtained on the issues discussed above. It is imperative to empirically validate these results using suitable household survey data and appropriate statistical and econometric methods. For that appropriate survey questionnaires were designed and household surveys were conducted in China and India. Chapter 2 presents a detailed description of these surveys and also presents summary statistics of responses.

1.3. Objectives of the Dissertation

The introduction section summarily describes the conceptualization, development and organization of the dissertation. The purpose of this dissertation and the key questions which I attempt to investigate in this dissertation are formally mentioned here as following.

1.3.1. Chapter 3: Credit Rationing: A Theoretical and an Empirical Analysis

Objective 1: Develop an analytical model that can explain both type I and type II credit rationing in the formal credit markets of the rural areas in the developing countries. This analysis helps in understanding the significance of various factors that influence credit rationing of the families in these areas.

Objective 2: Understand the disaggregated welfare implications of such credit rationing. This will help in understanding, in what manner different types of families are affected by such credit rationing.

Objective 3: Analyze the price responsiveness of loan demand and also understand how it is associated with the household assets of a family. The analysis related with this objective and objective 2 have important policy implications related with Pareto improving interventions in these credit markets.

Objective 4: Estimate the extent of credit rationing with the help of analytical results and by using household survey data from China and India and by employing suitable econometric methods. This analysis helps in understanding the severity of credit rationing in the formal credit markets of these rural areas and also helps in learning the significance of various factors that can explain such credit rationing.

Objective 5: Investigate the prevalence of information asymmetry in the formal credit market of the rural areas of developing Countries. This analysis will help in validating

the assumption of prevalence of information asymmetry in the formal credit markets of these areas. This asymmetric information framework has been used in Objective 1.

1.3.2. Chapter 4: Impact of Credit Constraints on Livelihood Choices

Objective 1: Develop an analytical model that can help in understanding the effects of credit constraints on agriculture input applications.

Objective 2: Develop an analytical model that can help in understanding the effects of credit constraints on the wage market outcomes for the families living in rural areas of the developing countries.

Objective 3: Analyze the impact of credit constraints on various livelihood choices such as, capital investment (physical and human), consumption, leisure, and decision to either become an entrepreneur or wage seeker. This analysis has been done using dynamic optimization framework. The process of borrowing, investment, outcome, consumption, and repayment evolves over time in an individual's life cycle. Hence learning the dynamics (and steady state equilibrium –if that exists) of these choice variables may strengthen our understanding of the influence of borrowing constraints on these choices of an individual over her life cycle.

Objective 4: Using household survey data from China and India, and suitable econometric methods; empirically investigate the effects of credit constraints on agriculture input applications, food security, and health and educational attainments.

1.3.3. Chapter 5: The Economics of Risk Sharing and Consumption Smoothing

Objective 1: Analyze the risk sharing and consumption smoothing motivations of the families who live in rural areas of the developing countries. This analysis will help in understanding the importance of risk sharing and consumption smoothing motives in the presence of credit constraints and incomplete insurance markets.

Objective 2: Investigate the risk sharing and consumption smoothing mechanisms of the families who live in rural areas of the developing countries. The three important mechanisms analyzed are – precautionary savings, risk sharing informal insurance and credit transactions.

Objective 3: Using household survey data from China and India, and suitable econometric methods; empirically investigate the significance of the variables associated with these mechanisms.

Objective 4: Using household survey data from China and India and the analytical results, empirically estimate the willingness of the families to pay for insurance coverage (in lieu of a steady income process) as a proportion of their annual income.

1.3.4. Chapter 6: The Economics of Informal Lending and Risk Sharing Motive

Objective 1: Investigate the significance of informal lending and borrowing among friends and relatives in rural areas of the developing countries. This analysis helps in understanding the magnitude of informal financial transaction among friends and relatives in these areas.

Objective 2: Develop an analytical framework to investigate the risk sharing and consumption smoothing motive that may explain such informal financial transactions. This analysis helps in understanding the mechanics of informal financial transactions and also helps in characterizing the loan amount, state contingent repayments, and default rates in equilibrium.

Objective 3: Using household survey data from China and India, and suitable econometric methods; empirically investigate the significance of the risk sharing motive explaining the informal lending and borrowing among friends and relatives.

1.3.5. Chapter 7: The Economics of Informal Lending and Fairness Motive

Objective 1: Risk sharing motive does not include social preferences such as altruism, trust, reciprocity and fairness, which seem to be important for these financial transactions. A growing body of evidence in literature suggests that people are also strongly motivated by these social preferences which can not be ignored in social interactions[1]. Hence it is important to understand the significance of these social preferences that may supplement our understanding of the underlying motives that sustain the informal financial transactions among relatives and friends in rural areas of the developing countries.

Objective 2: Develop an analytical model using fairness equilibrium framework proposed by Rabin (1993) to explain the fairness reciprocity as an important motive underlying the informal financial transactions among relatives and friends. Here outcomes are mutual –max when each person maximizes the other's material payoffs and mutual-min when each person minimizes the other's payoff. And hence if mutual-max equilibrium dominates the mutual-min equilibrium, then fairness can be advanced as an important motive for explaining such informal financial transactions. Informal borrowing and lending can be explained as mutual-max fairness equilibrium outcome.

Objective 3: Using household survey data from China and India and suitable econometric methods and appropriate identification strategies, empirically investigate the results related to fairness reciprocation (mutual-max and mutual-min) motives and informal lending and borrowing. In the survey conducted in India and China, specific questions were asked to families that would reveal whether the families have preferences for mutual-max or mutual-min social interactions.

[1] For a good review see Fehr and Schimdt (2006)

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Chapter 2: Description of the Household Surveys of China and India

Household surveys were conducted in rural areas of China (in years 2007 and 2008) and India (in year 2008-09). About 1550 families in China and 400 families in India were surveyed. The survey questionnaires were designed to elicit responses of families related to; (i) the credit rationing problems which they face, (ii) how credit rationing affects their livelihood choices, (iii) how they respond to overcome this problem, and (iv) the extent, types and motives for informal financial transactions among friends and relatives.

The chapter is organized as following. Section 1 describes the design process of survey questionnaires and presents a brief discussion on the types and relevancy of the questions. Section 2 presents a brief discussion on the field implementation of survey in China and India. Section 3 presents summary statistics of responses of the heads of the households on the questions as discussed in section 1.

2.1. Design of Survey Questionnaires

The survey consisted of several parts. The questions are designed to elicit most appropriate responses of the head of the households that will help in empirically validating the results and hypotheses of various chapters of this dissertation. As discussed in the Chapter 1 the important objectives of this dissertation are -

(i) To investigate the issues related to the need and availability of credits for the families, in the rural areas of developing countries, from formal credits markets (Banks and Rural Credit Cooperatives). Important objectives here are to understand the significance of various market conditions and variables that can explain the credit rationing phenomenon and estimate the extent of credit rationing

in these areas. Also this dissertation aspires to get inferences on the prevalence of information asymmetry in these credit markets.

(ii) To understand how the credit rationing problem affects various livelihood choices of the families such as, agricultural input applications, wage market outcomes, accumulation of physical capital and human capital, choices for preferred profession etc.

(iii)To understand the importance of various types of risks and uncertainties faced by these families and the measures they take to mitigate the effects of these risks and uncertainties. Various measures studied are; precautionary savings, risk sharing with other villagers, and informal lending and borrowing among friends and relatives.

(iv) To analyze the significance of underlying motives for informal lending and borrowing by these families among relatives and friends. One motive that is widely studied is risk sharing motive. This dissertation also wants to investigate the important issues related with the risk sharing motive.

(v) Further this dissertation proposes the fairness motive (Rabin, 1993) to supplement the explanation of informal borrowing and lending among relatives and friends in these areas.

Essentially the survey questions try to get most appropriate responses of the head of households in a most easy and accessible manner. The survey questions are designed under the close supervision and guidance of Prof. Calum Turvey. This has also benefited from the useful suggestions of Prof. David Just and Prof. Vicki Bogan and Professor Rong Kong of the Northwest Agricultural and Forestry University in Yangling, China. The survey questions are broadly categorized into important sections, which are described as following. The English version, Chinese version, and

Oriya version of the survey are enclosed in Annexure 1, Annexure 2, and Annexure 3 respectively.

2.1.1 Demographic and Socio- economic Information

The Questions, numbered from 0 to 10 provide information on important demographic and socio- economic variables such as, sex and age of the head of household, family size, educational attainment of the family members, household farm size, five important crops cultivated and income from farming, household income, any major sickness in the family etc. Question 27 provides information on household assets. These variables are used as explanatory and control variables in most of the estimations.

2.1.2 Sources of Risk and Risk Perceptions

The questions, numbered from 11 to 23 provide information on various types of risks and uncertainties faced by these families and various measures they take to mitigate these risks and uncertainties. Important among these include, Information on uncertainties in crop yields and crop prices, rainfall variations, temperature variations, various risk management options, availability of crop insurance and willingness to buy crop insurance and other insurance products, and willingness to adopt new technologies and management practices in farming. These variables give an idea on volatility of income of these families and the extent of willingness to pay for premium to make the income steady, but are not used extensively in this study.

2.1.3 Information on Household Debt

The questions, numbered from 24 to 41 provide information on important features of the household debt. Important among these include, amount of debt, composition of

debt source wise, use of the credit for various purposes, perception on the heaviness of debt level, interest rates charged by different institutions, denial of credit by banks or rural cooperatives, reasons for such denials, delay or default in repayments, degree of flexibility of repayment terms of loans belonging to different sources. These variables give important information on credit availability, credit rationing, credit usage, and repayments of loans.

2.1.4 Information on Trust and Guilt motives

The questions, numbered from 42 to 55 provide information on the motives related to trust perceptions in financial transaction with various sources such as, banks, rural cooperatives, relatives, friends and moneylenders and also related to guilty feelings on defaulting on repayment of loans. These variables are used as control variables in the estimations related to risk sharing motive and fairness motive explanation for informal borrowing and lending among relatives and friends.

2.1.5 Information on Precautionary Savings

The questions 57 and 58 provide information on savings and response to savings to reduction in uncertainty of income process. These variables are used to analyze the precautionary motives of saving for risk management and also control variables in other estimations.

2.1.6 Information on Credit Rationing in Formal Credit Markets

The questions, numbered from 59 to 76 provide information on credit needs, apprehensions in obtaining formal loans, credit rationing, and prevalence of information asymmetry such as adverse selection and moral hazard in the formal credit market. The responses to these questions are used to empirically investigate the

results related to credit rationing in the formal credit markets of rural areas in the developing countries.

2.1.7 Information on Credit Rationing Impact

The questions, numbered from 77 to 81 provide information on affects of credit rationing on various aspects of livelihood choices such as, agricultural input applications, educational and better health attainments, food availability etc. The responses to these questions are used to empirically investigate the results related to impact of credit rationing on livelihood choices.

2.1.8 Informal Borrowing and Lending among Friends and Relatives

The questions, numbered from 82 to 118 provide information on various aspects of informal lending and borrowing among friends and relatives in rural areas of the developing countries. The questions, numbered from 82 to 89 provide information on the prevalence of gifts and loan transactions in these areas. The questions, numbered from 90 to 93 provide information on these financial transactions that seem to be motivated by altruistic beliefs. The questions, numbered from 94 to 105 provide information on risk sharing aspect of these financial transactions. The questions, numbered from 106 to 113 provide information on flexibility aspects of these loans related to repayment, preferences on delaying and defaulting on repayments of these loans. The responses to these questions are used to empirically investigate the significance of risk sharing motives of informal lending and borrowing among the friends and relatives in rural areas of the developing countries. The questions, numbered from 114 to 116 provide information on mutual max fairness motive (Rabin, 1993) underlying these informal financial transactions and the questions, numbered 117 and 118 provide information on mutual min fairness motive. The

responses to these questions are used to empirically investigate the significance of mutual max and mutual min fairness motives of informal lending and borrowing among the friends and relatives in rural areas of the developing countries.

2.1.9 Field Experiment related to Assess Risk Aversion Coefficient

The question 119 reproduced here helps in conducting a simple field experiment (based on Binswanger, 1981) to estimate the partial risk aversion coefficient of the participants. Furthermore, these results are used to estimate the coefficient of relative risk aversion using the approximations suggested in Anderson and Dillon (1992).

"Imagine an honest stranger comes up to you and offers a gamble with the payout depending on the flip of a coin. If the coin lands heads you get the amount in the first column of Table 2A and if it lands tails you get the amount in the second column. Each has a 50% chance of occurring. If the gamble was repeated by many flips of the coin you would expect to receive the amount in the third column. While the odds of receiving the amount in the first column are the same as the odds in the second column the high and low values are different. Study the six gambles in the table and select the **one** gamble that you would prefer".

Table 2A: Measurement of Risk Aversion Coefficient (Binswanger, 1981)

Choice	Gain in Good luck: (RMB): 50% chance	Gain in Bad luck: (RMB): 50% chance	Expected value (RMB)	Risk Aversion class	Coeff. Of partial risk aversion at all levels
1	500	500	500	Extreme	7.5
2	950	450	700	Severe	3.615
3	1200	400	800	Intermediate	1.189
4	1500	300	900	Moderate	0.506
5	1900	100	1000	Slight to neutral	0.168
6	2000	0	1000	Neutral to preferred	≤0

2.2. Field Implementation of the Household Survey

The household survey in China was conducted in three phases. The first phase of survey was conducted in the year 2007. The survey was conducted with the help of Northwest Agriculture and Forestry University, China. Altogether 400 households spread over 4 villages in 1 province were covered. The Chinese survey was done under the supervision of Profs. Calum Turvey and Rong Kong. In this survey the responses were collected for the questions numbered from 1 to 54. The second phase of the survey was conducted by Rong Kong in August 2008. In this phase also 400 households spread over 4 villages in 1 province were covered. In this survey the responses were collected for the questions numbered from 1 to 57. The third phase of the survey was conducted in October 2008. In this survey 756 households were covered spread over 12 villages in 2 other provinces. This phase of survey was also done under the supervision of Prof. Calum Turvey. In this survey the responses were collected for all the questions numbered from 1 to 119. The details of the survey plan and scheduling are presented in Table 2.1.

Table 2.1: Plan and Scheduling of the Household Survey in China

Region	No. of Villages	No. of Households	Year of Suvey	Questions
Shaanxi (5)	4	400	2007	1 to 54
Henan (3)	4	400	August 08	1 to 57
Gansu (2)	6	355	October 08	0 to 119
Qianyang (4)	6	386	October 08	0 to 119
Total	20	1541		

The household survey in India was carried out in December 2008 and January 2009. The survey was done in the Orissa state. The planning for the survey was made in July – August 2008, when I visited the state. For the field planning and implementation of the survey, I took the help of Assistant Director of State Institute of Rural

Development (Orissa, Bhubaneswar), Mr. Saroj Dash and Dr. Prabhat Mohapatra who is supervising an agency in Bhubaneswar related with the household surveys.

We selected four districts distinctly lying in different agro climatic zones. Also these districts are quite different when socio- economic development indicators are considered. The four districts are Puri, Cuttack, Keonjhar and Mayurbhanj. Puri and Cuttack are comparatively close (30 miles) to capital city Bhubaneswar and these two districts are comparatively more economically developed regions. Other two districts, Keonjhar and Mayurbhanj are comparatively far (200 miles) from Bhubaneswar. Also these districts are comparatively less economically developed. Moreover, in these districts, majority of the population belong to scheduled tribes, which are economically less developed compared to the other categories of people.

In each district 5 villages were selected, which are well scattered and quite representative of the district. In each village, 20 households belonging to different economic categories are randomly selected for survey. Thus in each district 100 households are selected and totally 400 households are surveyed. The survey was conducted under my supervision. The survey was generously supported and funded by the endowments chaired by Prof. Calum Turvey. The details of the survey plan and scheduling are presented in Table 2.2.

Table 2.2: Plan and Scheduling of the Household Survey in India

Region	No. of Villages	No. of Households	Year of Suvey	Questions
Cuttack (6)	5	100	Dec-08 and Jan-09	0 to 119
Keonjhar (7)	5	100	Dec-08 and Jan-09	0 to 119
Mayurbhanj (8)	5	100	Dec-08 and Jan-09	0 to 119
Puri(9)	5	100	Dec-08 and Jan-09	0 to 119
Total	20	400		

2.3. Summary Statistics of Variables

Summary statistics of responses of the heads of the households on the questions as discussed in section 1 are presented here as following.

2.3.1 Summary Statistics of Demographic and Socio-economic Variables.

Summary statistics of important demographic and socio- economic variables for India and China are presented in Table 2.3 and Table 2.4 respectively.

Table 2.3: Summary Statistics of Important Socio-Economic Variables (India)

Variable	Obs	Mean	Std. Dev.	Min	Max
sex (Female=1)	399	0.00	0.05	0.00	1.00
Age	399	47.45	11.54	22.00	92.00
Education(1-7)	399	3.54	1.60	1.00	7.00
Education (1-4)	399	2.52	0.82	1.00	4.00
Household size	399	6.58	3.30	1.00	30.00
Years of Farming	399	24.05	11.82	2.50	70.00
Farm Size (acre)	399	2.96	2.39	0.15	20.00
Income source(farm=1)	399	0.78	0.42	0.00	1.00
Household Income (Rs.)	399	45440.85	37579.16	2400.00	300000.0
Percent Farm income	399	57.40	25.86	3.00	100.00
Household Asset Value (Rs.)	399	384313.30	359938.90	16000.00	2700000.0
Per cap income (Rs.)	399	7362.76	5326.65	600.00	50000.00
Per cap asset (Rs.)	399	64736.43	67422.58	1818.18	833333.3
Log income	399	10.51	0.63	7.78	12.61
Log asset	399	12.55	0.79	9.68	14.81
Log per cap income	399	8.72	0.60	6.40	10.82
Log per cap asset	399	10.76	0.80	7.51	13.63
Sickness in family(1=yes)	399	0.39	0.49	0.00	1.00
Income std. dev.	399	22299.04	44330.17	402.66	358209.1
Income coeff. of variation	388	0.39	0.16	0.09	0.95
Absolute risk aversion(*10-4)	399	0.11	0.17	0.00	2.00
Relative risk aversion coeff	399	2.05	1.48	0.00	4.00
Risk prone (1=yes)	399	0.98	0.13	0.00	1.00

Education (1-7) : 1- no education, 2- primary grade education incomplete, 3- primary grade education complete, 4- secondary grade education incomplete, 5- secondary grade education complete, 6- College/ University level education incomplete, 7- college/ University education complete.
Education (1-4): 1- no education, 2- primary grade education, 3- Secondary grade education, 4- College/ University level education.
Age: Age of the head of the household.
Risk prone: The family has suffered crop or cattle loss, major sickness, death in 1 year.

Table 2.4: Summary Statistics of Important Socio-Economic Variables (China)

Variable	Obs	Mean	Std. Dev.	Min	Max
Sex (Female=1)	741	0.10	0.30	0.00	1.00
Age	738	2.94	0.97	1.00	4.00
Education(1-7)	739	3.36	1.52	1.00	7.00
Education (1-4)	739	1.40	0.77	1.00	4.00
Household size	1540	4.39	1.54	0.00	21.00
Years of Farming	1538	27.35	13.14	0.00	70.00
Farm Size (mu)	1540	5.39	3.29	0.30	25.00
Income source(farm=1)	1540	0.42	0.49	0.00	1.00
Household Income (RMB)	1522	10559.52	8090.53	0.00	50000.00
Percent Farm income	1535	46.80	33.86	0.00	100.00
Household Asset Value (RMB)	1416	51112.29	44605.24	1000.00	500000.00
Per cap income (RMB)	1536	2707.55	2742.77	0.00	40000.00
Per cap asset (RMB)	1413	12625.41	11702.82	250.00	100000.00
Log income	1537	9.01	0.84	5.52	12.21
Log asset	1416	10.48	0.93	6.91	13.12
Log per cap income	1534	7.59	0.80	3.96	10.60
Log per cap asset	1413	9.06	0.93	5.52	11.51
Sickness in family(1=yes)	1540	0.19	0.40	0.00	1.00
Income std. dev.	1540	6625.39	74472.76	0.00	2323063.00
Income coeff. of variation	1469	0.31	0.16	0.00	0.99
Absolute risk aversion(*10-4)	1136	1.51	2.89	0.00	40.00
Relative risk aversion coeff	1136	2.77	1.52	0.00	4.00
Risk prone (1=yes)	741	0.77	0.42	0.00	1.00

Age: 1= (20-30) years; 2= (30-40) years; 3= (40-50) years; 4= over 50 years

2.3.2 Sources of Risk and Risk Perceptions

The summary statistics of important risks and uncertainties faced by the families are reported in Table 2.5.

Table 2.5: Percentage of Families Facing Various Risk and Uncertainties

Variable	Mean Value: China	Mean Value : India
Price Risk	.07	.06
Yield Risk	.06	.10
Weather Risk	.05	.09
Suffered Crop Loss, Cattle Loss	.70	.90
Suffered Death or Major Sickness in Family	.68	.91

The summary statistics of important risk management strategies of the families are presented in Table 2.6.

Table 2.6: Risk Management Options

Risk Management Options (scale : 1-5)	Mean. : India (N=400)	Mean. : China (N=1200)
Crops/ animal/ enterprise Diversification	3.94	3.95
Geographic diversification of plots	3.53	3.42
Irrigation	4.24	4.25
Spreading of sale of crops	3.03	3.45
Forward contracts of crops	2.84	3.45
Government Programs	3.23	3.89
Financial Reserves	3.67	3.70
Off farm income	3.59	3.99

2.3.3 Information on Debt

The summary statistics of important credit variables are presented in Table 2.7 and Table 2.8 for India and China respectively.

Table 2.7: Summary Statistics of Important Credit Transaction Variables (India)

Variable	Obs	Mean	Std. Dev.	Min	Max
Whether any Debt Outstanding	399	0.81	0.39	0.00	1.00
Amount of Debt (Rs.)	336	15659.08	21430.80	0.00	200000.0
Formal Loan Percent	325	48.40	44.80	0.00	100.00
Informal Loan Percent	325	36.25	42.44	0.00	100.00
Informal loan Amount (Rs.)	325	4015.19	8477.11	0.00	84000.0
Formal Loan Amount (Rs.)	325	10382.46	18877.72	0.00	200000.0
Propensity of Formal Loan (1=yes)	325	0.59	0.49	0.00	1.00
Propensity of Informal Loan (1=yes)	325	0.52	0.50	0.00	1.00
Informal formal loan ratio	325	0.11	0.23	0.00	1.62
Loan for production (1=yes)	389	0.65	0.48	0.00	1.00
Loan for risk management (1=yes)	390	0.23	0.42	0.00	1.00
Default on informal loan (1=yes)	399	0.20	0.40	0.00	1.00
Delay on informal loan (1=yes)	399	0.61	0.49	0.00	1.00
Default on formal loan (1=yes)	399	0.23	0.42	0.00	1.00
Delay on formal loan (1=yes)	399	0.50	0.50	0.00	1.00
Delay or default on formal loan (1=yes)	399	0.63	0.48	0.00	1.00
Delay or default on informal loan (1=yes)	399	0.83	0.37	0.00	1.00
Prefer not to default on informal loan (1=yes)	399	0.80	0.40	0.00	1.00
Prefer informal loan (1=yes)	399	0.51	0.50	0.00	1.00
Informal loans are convenient (1=yes)	399	0.53	0.50	0.00	1.00
Community Pressure Reduces Default (1=yes)	399	0.63	0.48	0.00	1.00

Note: Formal loan means loan taken from banks and rural cooperatives. Informal loan means loan taken from relatives and friends.

Risk Management purposes include expenditure on health/medicine, funeral, consumption. Production purposes include expenditure on Agriculture inputs, machinery and equipment, education, house construction.

Table 2.8: Summary Statistics of Important Credit Variables (China)

Variable	Obs	Mean	Std. Dev.	Min	Max
Whether any Debt Outstanding	1536	0.52	0.50	0.00	1.00
Amount of Debt (RMB)	1015	13165.81	26268.60	0.00	480000.00
Formal Loan Percent	809	34.72	42.00	0.00	100.00
Informal Loan Percent	809	63.92	42.30	0.00	100.00
Informal loan Amount (RMB)	800	8231.40	12475.78	0.00	150000.00
Formal Loan Amount (RMB)	800	7900.17	22005.97	0.00	398400.00
Propensity of Formal Loan (1=yes)	809	0.46	0.50	0.00	1.00
Propensity of Informal Loan (1=yes)	809	0.78	0.42	0.00	1.00
Informal formal loan ratio	791	1.46	3.31	0.00	50.00
Loan for production	1354	0.35	0.48	0.00	1.00
Loan for risk management	1354	0.22	0.41	0.00	1.00
Default on informal loan (1=yes)	1499	0.04	0.19	0.00	1.00
Delay on informal loan (1=yes)	1499	0.39	0.49	0.00	1.00
Default on formal loan (1=yes)	1485	0.02	0.15	0.00	1.00
Delay on formal loan (1=yes)	1540	0.14	0.35	0.00	1.00
Delay or default on formal loan	1501	0.39	0.49	0.00	1.00
Delay or default on informal loan	1511	0.45	0.50	0.00	1.00
Prefer not to default on informal loan	739	0.93	0.25	0.00	1.00
Prefer informal loan (1=yes)	674	0.72	0.45	0.00	1.00
Informal loans are convenient	739	0.82	0.38	0.00	1.00
Community Pressure Reduces Default	741	0.77	0.42	0.00	1.00

Further the composition of debt (formal and informal loans) along increasing quintiles of assets is presented in Table 2.9. Further Table 2.10 reports the usage of debt for risk management and production purposes along increasing quintiles of assets.

Table 2.9: Composition of Loan Portfolio of Families in India and China (percentages)

	India				China			
Quintile Assets	Formal Loan	Informal Loan	N	Mean (Informal>0)	Formal Loan	Informal loan	N	N Informal>0
1	32.82	35.5	72	.50	22.6	75.7	246	.84
2	36.91	48.38	48	.66	33.3	66.0	104	.79
3	46.29	44.66	67	.55	41.3	57.7	138	.73
4	61.95	28.37	70	.32	38.8	60.1	128	.77
5	63.22	26.2	57	.47	54.3	44.2	133	.66
Total	48.40	36.29	314	.52	35.9	62.8	749	.77

Table 2.10: Purpose of Borrowing by Families (percentages)

	India			China		
Quintile Assets	Loan risk	Loan production	N	Loan risk	Loan production	N
1	35	59	97	31	59	406
2	29	55	58	22	65	165
3	17	75	79	20	70	249
4	23	68	86	16	75	221
5	07	84	71	12	80	217
Total	23	68	391	22	68	1258

2.3.4 Information on Trust and Guilt motives

The summary statistic of important trust and guilt motives are presented in Table 2.11 and Table 2.12 for India and China respectively.

Table 2.11: Summary Statistics of Important Social Preference Variables (India)

Variable (Binary variables)	Obs	Mean	Std. Dev.	Min	Max
Risk share using gifts or loans	399	0.73	0.44	0.00	1.00
Trusts that informal loan will be rapid (trust1)	399	0.79	0.40	0.00	1.00
Will lend even does not trust that loan will be repaid(trust2)	399	0.45	0.50	0.00	1.00
Will lend or borrow even they have refused earlier (alt1)	399	0.79	0.41	0.00	1.00
Stronger version (and conditions) of (alt1)	399	0.27	0.45	0.00	1.00
Strong guilty feeling on defaulting informal loan	399	0.30	0.46	0.00	1.00
Strong guilty feeling on defaulting formal loan	399	0.32	0.45	0.00	1.00

Table 2.12: Summary Statistics of Important Social Preference Variables (China)

Variable (Binary variables)	Obs	Mean	Std. Dev.	Min	Max
Risk share using gifts or loans	741	0.67	0.47	0.00	1.00
Trusts that informal loan will be rapid (trust1)	1535	0.90	0.30	0.00	1.00
Will lend even does not trust that loan will be repaid(trust2)	1538	0.62	0.49	0.00	1.00
Will lend or borrow even they have refused earlier (alt1)	740	0.81	0.39	0.00	1.00
Stronger version (and conditions) of (alt1)	740	0.52	0.50	0.00	1.00
Strong guilty feeling on defaulting informal loan	1540	0.54	0.50	0.00	1.00
Strong guilty feeling on defaulting formal loan	1540	0.44	0.50	0.00	1.00
Mutual-min Reciprocity	741	0.40	0.49	0.00	1.00
Mutual max Reciprocity	741	0.73	0.45	0.00	1.00
Mutual max and Mutual-min Reciprocity	1540	0.15	0.36	0.00	1.00

2.3.5 Precautionary Savings

The summary statistics of saving by the households is presented in Table 2.13. Further the changes in savings in response to reduction in uncertainty in income are reported in Table 2.14.

Table 2.13: Saving Behavior of Families

Proportion of Household income saved in a year	China		India	
	Freq.	Percent	Freq.	Percent
(No saving)	367	48.61	114	28.50
less than 5%	147	19.47	176	44.00
between 5 and 10%	93	12.32	94	23.50
More than 10% (High saving)	148	19.60	16	4.00
Total	755	100.00	400	100.00

Table 2.14: Response to Savings if there is Reduction in Uncertainty in Income

Response to savings, if there is a significant reduction in uncertainty in income	Variable Remark	China		India	
		Freq.	Percent	Freq.	Percent
Decrease savings and increase investment	Precautionary savings	288	38.30	152	38.00
Decrease savings and increase purchases		91	12.10	32	8.00
Decrease savings and increase travel/vacations		10	1.33	3	0.75
Maintain the same amount of savings		50	6.65	18	4.50
Increase savings slightly	Increase savings	158	21.01	135	33.75
Increase savings a lot		155	20.61	60	15.00
Total		752	100.00	400	100

2.3.6 Credit Rationing Variables

Table 2.15 reports the mean values of various types of apprehensions in obtaining formal loans. Table 2.16 reports the mean values of various reasons for denial of formal loans.

Table 2.15: Apprehension in Obtaining Loan from Banks and RCC

Variable : Apprehension in getting loan due to Binary variable(1=yes, 0=no)	Mean: India N=400	Mean: China N=687
Unpaid loans	.44	.53
Higher interest rate than that of friends or relatives	.41	.70
Unaffordable interest rate	.35	.69
Lack of collateral	.46	.54
Long delay in processing loan	.92	.36
Bribes	.80	.28
Prefer to borrow from friend or relative	.51	.72
Do not like to be indebted to bank or RCC	.44	.68

Table 2.16: Reason for Denial of Loan from Banks or RCC

Variable: Denied loan due to	*Mean: India (N=180)*	*Mean : China (N=524)*
Lack of collateral (1=yes)	.50	.65
Yield risk (1=yes)	.1	.04
Fail to replay past loan (1=yes)	.32	.18
Not trustworthy (1=yes)	.25	.45
Low income (1=yes)	.16	.49

The summary statistics on various sources of getting credit rationed are reported in Table 2.17. It also summarizes the extent of credit rationing in India and China, as directly observed in the data.

Table 2.17: Description of Borrowing Behavior and Credit Constraint

Variable (binary variables) : Values reported in percentage	China		India	
	Mean	Observations	Mean	Observations
Loan application rejected (a)	.31	1010	.41	399
Could not get adequate loan for various purposes (b)	.30	756	.45	384
Never get desired amount of loan (c)	.38	1320	.62	400
Sometimes got desired amount of loan	.30	1320	.30	400
Always got desired amount of loan	.32	1320	.07	400
Credit Rationed =1; if either of a,b,c=1	.58	1418	.66	400

Further summary statistics of relevant credit rationing variables are presented in Table 2.18 and Table 2.19 for India and China respectively.

Table 2.18: Summary Statistics of Important Credit Rationing Variables (India)

Variable	Obs	Mean	Std. Dev.	Min	Max
Denied formal loan	399	0.44	0.50	0.00	1.00
Denied because of lack of collateral	399	0.46	0.50	0.00	1.00
Interest rate unaffordable (highrate1)	399	0.35	0.48	0.00	1.00
Likely to borrow more if interest rate is reduced (highrate2)	399	0.97	0.18	0.00	1.00
Credit constrained (Creditconstr1)	399	0.64	0.48	0.00	1.00
Credit constrained (Creditconstr11)	399	0.86	0.34	0.00	1.00

Creditconstr1: Denied loan + could not borrow desired amount of loan for education, health, consumption, farming and business purposes; from formal sources
Creditconstr11: Denied loan +Never got desired amount of loan + could not borrow desired amount of loan for education, health, consumption, farming and business purposes

Table 2.19: Summary Statistics of Important Credit Rationing Variables (China)

Variable	Obs	Mean	Std. Dev.	Min	Max
Denied formal loan	1530	0.27	0.44	0.00	1.00
Denied because of lack of collateral	521	0.65	0.48	0.00	1.00
Interest rate unaffordable (highrate1)	674	0.54	0.50	0.00	1.00
Likely to borrow more if interest rate is reduced (highrate2)	674	0.69	0.46	0.00	1.00
Credit constrained (Creditconstr1)	1540	0.36	0.37	0.00	1.00
Credit constrained (Creditconstr11)	1539	0.57	0.48	0.00	1.00

2.3.7 Credit Rationing Impact

The effects of credit rationing on agriculture input applications, food availability, and educational and health attainments along increasing quintiles of assets are reported in Table 2.20. The percentage value indicates the percentage of families who believe that credit rationing has impacted the above choices.

Table 2.20: Effects of Credit Constraints on Various Livelihood Choices (Percentage)

	China (N= 743)			India (N=400)		
Asset Quintile	Low input	Less food	Less education	Low input	Less food	Less education
1	80	22	64	78	65	67
2	77	31	58	90	63	73
3	75	20	45	81	50	64
4	66	21	49	81	43	51
5	71	16	37	61	38	43
Total	74	21	50	78	52	60

2.3.8 Informal Borrowing and Lending

The summary statistics of gifts and loan transactions among relatives and friends in rural areas of the developing countries are presented in Table 2.21.

Table 2.21: Important Aspects of Informal Financial Transactions among Friends or Relatives

Variable (mean value shows the fraction of respondents who agree to the question: 1=yes)	Mean Value : India (N=400)	Mean Value: China (N=739)
Gift transactions among friends and relatives	.67	.25
Loan transactions among friends and relatives	.97	.94
Gift for emergency purposes	.71	.59
Loan for emergency purposes	.96	.98
Prefer loan for emergency purposes	.88	.82
Prefer loan for general purposes	.73	.84
Prefer not to default on such loans	.80	.93
Community pressure helps in reducing default	.76	.63

The summary statistics of risk sharing using monetary gifts and loan transaction among relatives and friends are presented in Table 2.22

Table 2.22: Risk Sharing Using Gifts and Loans

Variable (Binary variables)	Obs	Mean	Std. Dev.	Min	Max
Risk share using gifts or loans (India)	399	0.73	0.44	0.00	1.00
Risk share using gifts or loans (China)	741	0.67	0.47	0.00	1.00

The summary statistics of important motivations for informal financial transactions among relatives and friends are presented in Table 2.23.

Table 2.23: Important Motivations of Financial Transactions among Friends or Relatives

Variable (mean value shows the fraction of respondents who agree to the question: 1=yes)	Mean Value : India (N=400)	Mean Value: China (N=739)
Prefer to borrow from friends or relatives	.50	.72
Flexibility in loan repayment	.87	.93
Flexibility in interest amount repayment	.83	.76
Borrowing from friends or relatives convenient	.89	.96
Trust that loans given to friends or relatives will be repaid	.79	.90
Loans given even not trust that loan will be repaid	.45	.63
Agree to borrow or lend even they have refused earlier	.27	.52

Table 2.24 presents summary statistics of default and delay in repayment of formal and informal loans.

Table 2.24: Default and Delay in Repayment of Formal and Informal Loans

Variable	Mean Value (N=384) India	Mean Value (N=1514) China
Default on formal Loan	.23	.03
Default on Informal Loan	.20	.04
Delay on Formal Loan	.51	.15
Delay on Informal Loan	.61	.38

The summary statistics of mutual-max and mutual-min fairness reciprocity are presented in Table 2.25.

Table 2.25: Summary Statistics of mutual-max and mutual-min Reciprocity

Variable (Binary variables)	Obs	Mean	Std. Dev.	Min	Max
Mutual-min Reciprocity (India)	399	0.51	0.50	0.00	1.00
Mutual max Reciprocity (India)	398	0.64	0.48	0.00	1.00
Mutual max and Mutual-min Reciprocity (India)	399	0.44	0.50	0.00	1.00
Mutual-min Reciprocity (China)	741	0.40	0.49	0.00	1.00
Mutual max Reciprocity (China)	741	0.73	0.45	0.00	1.00
Mutual max and Mutual-min Reciprocity (China)	1540	0.15	0.36	0.00	1.00

Further the summary statistics of mutual-max and mutual-min fairness reciprocity along increasing quintiles of assets are presented in Table 2.26

Table 2.26: Percentages of Families Prefer to behave as Mutual-max and Mutual min

Asset	India			China		
quintile	mutual-max	mutual -min	N	mutual-max	Mutual- min	N
1	71	62	101	77	47	165
2	58	43	60	68	44	88
3	59	49	79	73	41	162
4	54	41	88	65	32	152
5	75	57	72	77	35	176
Total	64	51	400	73	40	743

Further the percentage distributions of the families demonstrating mutual-max, mutual-min and any combination of these have been reported in Table 2.27.

Table2.27: Categorization of Families along mutual-max and mutual-min (%)

mutual-max	mutual-min (China)			mutual-min (India)		
	0	1	Total	0	1	Total
0	(0,0)19.44	**(0,1)8.07**	27.51 (208)	28.75	**7.25**	36.00 (144)
1	**(1,0)40.61**	(1,1)31.9	72.49 (508)	**20.00**	44.00	64.00 (256)
Total	60.1(454)	39.9(302)	100.0 (756)	48.75	51.25	100 (400)

2.3.9 Field Experiment related to Assess Risk Aversion Coefficient

The results of the experiment intended to estimate the partial risk aversion coefficient and also relative risk aversion coefficient (as discussed in section 1.9) are reported in Table 2.28. In the table the percentage distribution of the families are shown, who made choices of the given gambles.

Table 2.28: Frequency Distribution of Families for Coefficient of Relative Risk Aversion

Coefficient of	India			China		
Relative risk aversion (r.r.)	Freq.	Percent	Cum.	Freq.	Percent	Cum.
Risk Neutral : 0	63	15.79	15.79	137	12.06	12.06
Low Risk Averse: 0.5	36	9.02	24.81	57	5.02	17.08
Moderate Risk Averse: 1	66	16.54	41.35	88	7.75	24.82
High Risk Averse: 2	73	18.3	59.65	143	12.59	37.41
Severe Risk Averse: 3	57	14.29	73.93	101	8.89	46.3
Excessive Risk Averse: 4	104	26.07	100	610	53.7	100
Total	399	100		1,136	100	

It is arranged in descending order of the choices. For example, the participants who chose gamble 1 are excessive risk averse and they are shown in the last row. Similarly the participants who chose gamble 6 are risk loving or almost risk neutral and they are shown in the first row.

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Chapter 3: Credit Rationing: A Theoretical and an Empirical Analysis

The main objective of this chapter is to assess the credit rationing problem in the rural areas of developing countries. Using asymmetric information framework both type I and type II credit rationing are demonstrated. Equilibrium is attained using loan size, interest rate and collateral requirements as screening and incentive devices. Further, the welfare implications of credit rationing are analyzed. The analysis also suggests that the price elasticity of loan demand is inelastic, however price responsiveness of the borrowers having lower assets is found to be comparatively higher. These have important policy implications. Then using household survey data from China and India, some of these results are empirically tested. Overall considerable amount of credit rationing is observed and assets endowment and ability to post collateral are found to be significant explanatory variables. Also a test for information asymmetry in these credit markets is proposed and significant results are obtained.

3. 1. Introduction

Credit is a key input needed to undertake most economic production activities. However it is also known that credit markets function quite differently from standard markets[2]. The standard competitive market of a homogenous good works on the premise that agents are price takers, delivery of good and payment for transactions happen simultaneously and markets clear at the prevailing market price. But there is a finite time lag between the delivery of credit and repayment. Also when the borrower is protected by a limited liability clause; repayment is contingent on several factors such as project outcomes and incentives, which the borrower faces. Defaulting on loan

[2] See, Jaffe and Stiglitz (1990). Credit Rationing, Chapter 16 for more on this.

repayments is a fact of reality. In such a scenario the price of credit may not be able to clear the market and there may be excess demand of credit. Hence credit rationing may occur which is observed in the credit market.

The key objectives of this chapter are to investigate the phenomenon of credit rationing in the formal credit markets of rural areas in developing countries and estimate the propensity of credit rationing at the household level. The chapter is motivated by two important observations. First, in these areas income from agriculture constitutes a large portion of household income. Data obtained from household surveys (discussed later) in China and India reveals that farm income constitutes about 48 and 57 percent of family income respectively of two countries. Second, credit is an important input for livelihood for many farm households in developing countries. Further formal credit markets; banks and rural credit cooperatives (RCC) are not well developed in such areas. All these factors provide an appropriate setting to conduct a theoretical and empirical analysis of credit rationing.

Household surveys were conducted in rural areas of China (in years 2007 and 2008) and India (in year 2008-09). About 1500 families in China and 400 families in India were surveyed. The survey questionnaires are designed to elicit responses of families related to - (i) the credit rationing problems they face, (ii) how credit rationing affects livelihood choices, and (iii) how they respond to overcome credit rationing. The survey data is used in this chapter to empirically investigate the credit rationing results and also to test for presence of information asymmetry in these credit markets.

In order to motivate this chapter some initial findings are presented here. For example we find that more than 90 percent families in India and China are apprehensive about getting loans from banks or RCC for various reasons as summarized in Table 3.1. Further about 45 percent families in India and 30 percent families in China have been

denied loans from RCC or banks, for a variety of reasons, which are summarized in Table 3.2. Evidently lack of collateral seems to be a major reason for denial of loan.

Table 3.1: Apprehension in Obtaining Loan from Banks and RCC

Variable : Apprehension in getting loan due to Binary variable(1=yes, 0=no)	Mean: India N=400	Mean: China N=687
Unpaid loans	.44	.53
Higher interest rate than that of friends or relatives	.41	.70
Unaffordable interest rate	.35	.69
Lack of collateral	.46	.54
Long delay in processing loan	.92	.36
Bribes	.80	.28
Prefer to borrow from friend or relative	.51	.72
Do not like to be indebted to bank or RCC	.44	.68

Table 3.2: Reason for Denial of Loan from RCC or Bank

Variable: Denied loan due to	*Mean: India (N=180)*	*Mean : China (N=524)*
Lack of collateral (1=yes)	.50	.65
Yield risk (1=yes)	.1	.04
Fail to replay past loan (1=yes)	.32	.18
Not trustworthy (1=yes)	.25	.45
Low income (1=yes)	.16	.49

It is also observed that families belonging to lower quintiles of assets depend more on informal loans (obtained from friends, relatives, and moneylenders) and families in higher quintiles of assets depend more on formal loans (obtained from banks and RCC). These facts demonstrate that a large number of families in these economies face substantial credit rationing.

Credit rationing is normally understood as a situation when demand for loan exceeds its supply at the prevailing interest rate. Keeton (1979) defined credit rationing more formally and proposed two types of rationing.

(a) Type I Rationing: some or all loan applicants get a smaller loan than they desire at the quoted loan rate of interest.

(b) Type II Rationing: Some loan applicants are denied a loan even though for the bank they are indistinguishable from accepted applicants.

There are two strands of theories to explain credit rationing[3]: First, Hodgman (1960), Freimer and Gordon (1965), and Jaffee and Modigliani (1969), explain credit rationing based on various imperfections in loan markets. Applicants and loans are differentiated based on heterogeneities in a particular characteristic with respect to which they differ. Second, Jaffe and Russel (1976) and particularly Stiglitz and Weiss (1981), demonstrate credit rationing based on the prevalence of asymmetric information (between the borrower and lender) related to the types and incentives of the borrowers.

Indeed there is a substantial amount of research that attempts to explain the phenomena equilibrium credit rationing in different contexts. This chapter builds upon this research and attempts to explain both type I and type II credit rationing in the rural credit markets. This chapter also aims to analyze welfare implications of credit rationing. A further contribution of this chapter is to conduct an empirical analysis to assess the extent of credit rationing at the household level and propose a test of information asymmetry in the credit market. The chapter is organized as following.

A brief literature review on theory of credit rationing is presented in section 2. As the main objective of this chapter is to study the credit rationing problem in rural areas of developing countries, an illustrative model of credit rationing is developed in section 3 which studies both type I and type II credit rationing in equilibrium and important results are obtained. Then section 4 presents a brief analysis on welfare implications of credit rationing. Further the analysis suggests that price elasticity of loan demand is inelastic, however the price responsiveness of the borrowers having lower assets is

[3] See Jaffe and Stiglitz (1990), Chapter 16, and Clemenz (1986), chapter 1 for more on this.

found to be comparatively higher. Also a brief suggestion on policy matters is presented here. Then in section 5, using these results empirical models have been developed that estimate extent of credit rationing at household level. Further nature of associations of variables that may influence credit rationing has been studied here. Also a test has been proposed here to test for information asymmetry in credit market. Section 6 concludes with important observations.

3. 2. Literature Review

Much of the earlier literature on credit rationing attempted to explain type I rationing. Hodgman (1960) explained credit rationing as a rational response by the lender to minimize the risk of default. He showed that the supply curve becomes vertical at a critical value of loan L* and beyond this the lender will not give loan at any higher interest rate, as the risk of default dominates the gain at higher interest rate beyond L*. If the borrower's demand of credit is higher than L*, she is type I credit rationed. Freimer and Gordon (1965) demonstrated that there exists an interior optimal loan L* at interest rate R*, that maximizes the lender's expected profit; a borrower asking for a loan more than L* will not get the loan, even if she is willing to pay more that R*. Jaffee and Modigliani (1969) explained credit rationing by using the assumption that the lender behaves as a discriminating monopolist. He extends differentiating loan contracts (loan amount and interest rate) to different groups of borrowers depending on firm size and risk. A more than optimal loan amount is not offered even though the borrower is willing to pay a higher interest rate.

However the recent literature – starting with Jaffe and Russel (1976) and particularly Stiglitz and Weiss (1981), demonstrated credit rationing based on the prevalence of asymmetry in information related to the types and incentives of the borrower. Jaffe and Russel (1976) explained credit rationing by assuming two types of borrowers;

honest and dishonest, which is private knowledge of the borrower. Honest borrowers always repay the loan and dishonest borrower default on repayment, when the cost of default is no larger than cost of full repayment. This incentive for default by the dishonest borrower may make the loan supply function backward bending, which may lead to credit rationing in equilibrium. The honest borrowers may prefer rationed allocation as rational responses not to cross subsidize the dishonest borrower. As dishonest borrower's utility is an increasing function of size of loan, the lender uses the loan size as contract parameter to induce self-selection between the honest and dishonest borrower.

Stiglitz and Weiss (1981) presented a detail description of type II rationing in equilibrium that consequently spawned a great amount of research in this area. The main ideas propounded in the paper are that: (a) the lenders get a pool of projects with mean preserving spreads of returns (same mean with different variances) to finance. Lenders do not know the variance of projects, only borrowers know that; (b) Interest rate may itself affect the riskiness of the pool of loans or borrowers by adverse selection of pool of borrowers comprising of more risky projects and also moral hazard effect induces the borrowers to switch over to more risky projects as the interest rate increases; (c) The borrower is protected by a limited liability clause. Under these circumstances the expected profit (return) of the lender is not a monotonically increasing function of interest rate, hence the backward bending supply curve is obtained as shown in Figure 3.1. Hence market clearing Walrasian equilibrium may not be obtained and credit rationing is obtained in equilibrium; each lender optimally sets interest rate below that of market clearing level where demand of loan exceeds its supply.

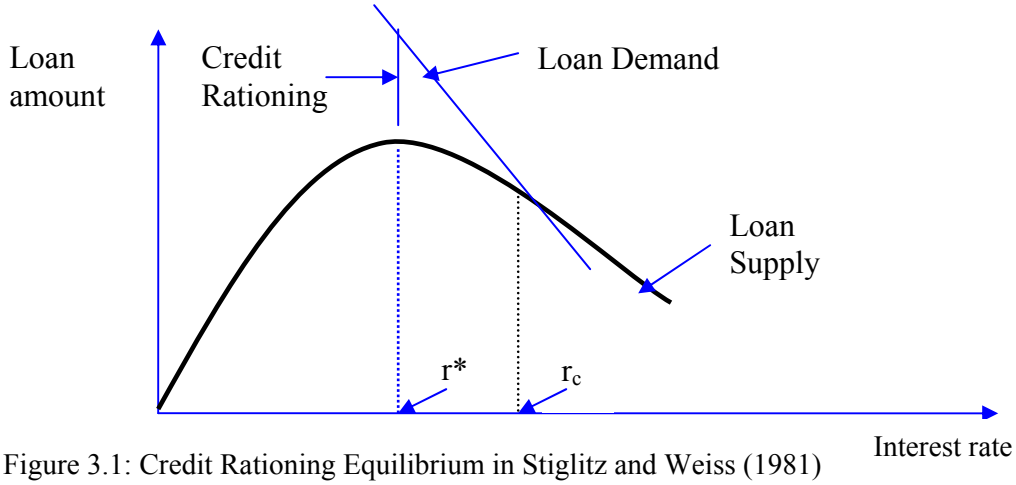

Figure 3.1: Credit Rationing Equilibrium in Stiglitz and Weiss (1981)

The equilibrium is described by a configuration of loan contracts – {B,r*,C}, where B is the amount of borrowing, r* is the interest rate, and C is the collateral; such that all loan contracts offered yield the same expected return, and there does not exist another contract which can yield, a larger expected return. The lenders will not use the increasing of interest rates or higher collateral requirements to clear the market, as doing so may increase the riskiness of bank's loan portfolio, either by lower rate of participation of safer borrowers or by inducing borrowers to undertake riskier projects. Subsequently several authors studied credit rationing under different contexts. Important among these are mentioned as following.

Besanko and Thakor (1987 b) analyzed the possibility of credit rationing under monopolistic and competitive credit markets. They assumed that distribution of returns to a low risk borrower exhibits first order stochastic dominance over the distribution of returns to a high-risk borrower – this is in contrast with the assumption in Stiglitz and Weiss (SW-1981), where it was second order stochastic dominance. With this assumption, they observed that, with an increase in interest rate, high-risk borrowers first drop out and not the low risk borrowers. Their main results are:

a) In the monopolistic setting, the collateral will not be used unless it is sufficiently valuable to the bank to make the loan riskless.
b) In the same setting, bank's credit policy discourages high-risk borrowers from applying for credit – it raises the interest rate to induce them to exit the market.
c) In the perfectly competitive setting, collateral plays a useful role. Low risk borrowers choose contracts with low interest rates and high collaterals, whereas high risk borrowers make opposite choice.
d) In this setting, insufficient borrower wealth endowments may result in some borrowers being denied credit. So equilibrium credit rationing is possible even when collateral is available and deposit supply is perfectly elastic.

Hence in contrast to a monopoly, the competitive equilibrium involves collateral as a sorting device, since posting collateral is more costly to the high-risk borrower. Low risk borrowers provide collateral and pay a lower interest rate, whereas the high-risk borrowers pay a higher interest rate and provide no collateral.

Bester (1985) explained that no credit rationing would occur in equilibrium if banks use the contract instruments, interest rate and collateral requirement simultaneously rather than separately, as self-selection mechanism to sort the borrowers. It also assumes that there is no wealth constraint for posting collateral. Bester demonstrated that equilibrium in credit market is characterized by the separation of borrowers of different risks. There does not exist a pooling equilibrium; given pooling of different risks in one contract is not viable (Rothschild and Stiglitz, 1976) in a competitive equilibrium whenever self-selection mechanisms are available. If pooling occurs, then there exists another loan contract that is profitable since that contract will attract only safe borrowers from the pooling equilibrium**.** Since the pooling equilibrium is not viable if a signaling mechanism is available, there will not be credit rationing since a

credit rationing equilibrium always pools good and bad risks. Bester's argument fails if wealth constraint binds, which in the context of the current chapter is probably true. Now building upon these works, an analytical model of credit rationing is presented in the following section that studies both type I and type II credit rationing.

3. 3. An Illustrative Model for Credit Rationing

As discussed earlier, Stiglitz and Weiss (1981) and many subsequent papers studied the type II rationing that emphasize the use of interest rate and collateral as screening and incentive devices. However, in the rural areas it is also observed that many people do get the credit but not to the extent that they need the loan (type I rationing), while many are not able to get the loan at all (type II rationing). Hence the objective of this section is to develop a model of credit rationing that demonstrates possibility of both type I and type II credit rationing equilibria. The proposed model uses loan size as screening and incentive device, in addition to interest rate and collateral requirements.

As discussed in earlier sections the likelihood of repayment may depend upon various factors, which the borrower can influence to a large extent. In response to this the lender designs the contract in such a manner that elicits the best possible information about the borrower (type of borrower, risks and so on) while influencing the borrower's action suitably after signing the contract. The lender uses interest rate, collateral requirements, and loan size as screening and incentive devices which limits the power of these instruments to clear the market (price is not able to adjust to clear the market) and thus credit rationing is obtained in equilibrium.

The model is developed from a number of important contributions including Besanko and Thakor (1987a) and Schmidt-Mohr (1997). Besanko and Thakor (1987a) used assumptions of risk neutrality of both borrowers and lenders and assume first degree of stochastic dominance relation of the project outcomes. Schmidt-Mohr (1997) used

assumptions of risk aversion of borrower and risk neutrality of the lender and assumes second degree of stochastic dominance relation of project outcomes.

In this chapter, I assume that the borrowers are risk averse and the lenders are risk neutral. However, I add an additional and critical assumption that the probability of success of the project depends upon a vector of endowment characteristics (wealth, ability, honesty, entrepreneurship etc.) of the borrower. The wealthier (in the endowment vectors) the borrower is higher is her probability of success and hence higher is expected value of profit. This assumption is realistic in the sense that the endowment vectors of an entrepreneur positively affect the probability of success of the project as well as it enters in the production function to give advantage of scale.

3.3.1. Main Assumptions and Description of the Economy

3.3.1. A. Borrower: Borrowers are assumed to be a heterogeneous pool of risk averse persons. Each one is endowed with different level of endowment A_i, which is used as a fixed factor in the production. The endowment A_i, may be a vector of characteristics such as wealth, ability, entrepreneurship etc. Now for working capital and other ancillary expenses for taking up a project, the borrower needs working capital L_i. Assume that the production function g (A_i, L_i) is same for all borrowers and is well behaved.

$$g_L(A_i, L_i) > 0; g_A(A_i, L_i) > 0;\ g_{LL}(.,.) < 0; g_{AA}(.,.) \leq 0; g_{AL}(.,.) \geq 0 \qquad ...(3.1)$$

The differentials of the production function have standard interpretation.

Assume that the borrower gets a loan contract $\{r_i, C_i, L_i\}$, where r_i is the rate of interest on loan, C_i is the amount of collateral, and L_i is the loan size. The borrower is an expected utility maximizer. Assuming standard von Neumann-Morgenstern (VNM) utility function

U(.), with U'(.) > 0, U''(.) < 0, borrower maximizes $\underset{\{r,C,L\}}{EU(\pi_i)}$.It is assumed that the probability of success is $p(A_i)$, where A_i is the borrower's endowment vector, and p'(A) >0. In the case of failure borrower gets no return from the project. Also it is assumed that borrower has income in every period W_i.

In the case of success, the borrowers earns profit π_i from undertaking the project.

$$\pi_i = g(A_i, L_i) - (1 + r_i)L_i \geq 0; \quad \ldots(3.2)$$

Let $g(A_i, L_i) = (A_i L_i)^{\psi}; 0 < \psi < 1 : \psi =$ Production elasticity w.r.t., A and L.

3.3.1. B. Bank: It is assumed that the bank functions in a perfect competitive environment; in the sense of free entry and no collusion of the banks. In equilibrium, the bank need to get the expected repayment equal to the cost of loan, which is 1+ρ, that satisfies zero profit criteria. Bank is assumed to be risk neutral.

3.3.1. C. Information Structure: In the first best case, there is no information asymmetry. The bank knows the probability of success of each borrower and also there is no problem of strategic default. Alternatively, two types of information asymmetry can exist. One, the bank does not know the success probability of each individual, but knows the average success probability of the pool of borrowers – this gives rise to adverse selection problem. The borrowers can get a separating equilibrium using the collateral (also loan size) as a signaling device. This adverse selection may give rise to both type I and type II rationing. Another information asymmetry problem arises from the strategic default decision of borrower – this gives rise to the problem of moral hazard. To resolve this problem, the bank may limit the size of loan, which can be less than that of first best contract under perfect information and this gives rise to type I rationing. Also it may give rise to type II rationing if the

loan size is so restrictive that the borrower's reservation utility is not met, and the borrower drops out of the loan market.

3.3.1. D. Concept of Equilibrium: It is now well studied that once the assumption of perfect information in the economy is dropped, several properties of the Arrow-Debreu model no longer hold. The asymmetric information may have the following consequences for market equilibria[4] - (a) an equilibrium may not exist, (b) there may exist equilibria with price dispersion, (c) there may exist equilibria with rationing, and (d) there may exist Pareto-inefficient equilibria.

In informational asymmetries, equilibrium is often guided by the strategic interplay of the agents. The concept of a non-cooperative Nash equilibrium in a competitive setting seems most appropriate here. The basic idea behind competitive markets involves free entry and noncollusive behavior among the participants. More precisely, a Nash equilibrium is a set of credit contracts such that each contract yields non negative profits to the bank, and there does not exist any other set of contracts, which offered to in addition of this set, yields positive profit in the aggregate and non-negative profits individually. Thus no player has an incentive to deviate unilaterally[5]. No formal proof is attempted here on the existence and uniqueness of equilibrium for different cases.

3. 3.1. E. Optimal decisions of Borrowers and Banks

As said earlier, the borrower maximizes the expected utility conditional on the bank makes zero profit. The choice variables are loan size, interest rate and collateral amount. The optimal values of these variables in equilibrium will vary depending on the assumptions on the information structure of the economy. The next part of this section conducts analysis of credit rationing under different conditions.

[4] Followed from, Clemenz, G., and Mona, R. (1992).
[5] Followed from, Louis (1988), Stiglitz and Weiss (1981, 1986), and Besanko and Thakor (1987 b).

3.1 First Best Case (No Information Asymmetry)

In the first best case, when there is no information asymmetry, perfect competition equilibrium notion is applied. It is the benchmark case, against which other outcomes will be compared. Also by welfare theorems the equilibrium will be Pareto efficient. The analysis of equilibrium allocation is as following.

$$\text{Borrower}: \max_{\{r_i, C_i, L_i\}} EU(\pi_i) = p_i(A_i)U(g(A_i, L_i) + W_i - (1+r_i)L_i) + (1 - p_i(A_i))U(W_i - C_i(A_i))$$

$$\text{subject to}: \text{Bank's profit} = p(1+r)L + (1-p)C(A) - (1+\rho)L \geq 0$$

It is assumed that supply of loan is perfectly elastic at the depositor's interest cost ρ.

For a contracted interest rate (zero profit condition of bank yields that) , and collateral size C_i, the first order condition w.r.t. L_i, gives equation for optimal loan amount as following,

$$p_i(A_i)U'(g(A_i, L_i) + W_i - (1+r_i)L_i)(g_L(A_i, L_i) - (1+r_i)) = 0$$

$$\Rightarrow g_L(A_i, L_i^*) = (1+r_i): \quad \text{Since } U'(.) > 0 \text{ (by monotonicity assumption)} \qquad ...(3.3)$$

The interest rate faced by a borrower comes from the zero profit condition of the bank. Here, L_i^* is the first best loan size in equilibrium. Solving (3.3) (for neatness subscript i is dropped) following expressions are obtained.

$$\psi A^{\psi} L^{*\psi-1} = 1 + r \qquad \Rightarrow L^* = \left(\frac{\psi A^{\psi}}{1+r}\right)^{\frac{1}{1-\psi}} \qquad ...(3.4)$$

This also implies; $\dfrac{\partial L^*}{\partial A} > 0$; $\dfrac{\partial L^*}{\partial r} < 0$; $\forall A > 0, r > 0$;

The bank offers a set of credit contracts K= $\{r_i, C_i, L_i\}$, such that each one yields zero profit to the bank. This has been shown in Figure 3.2.

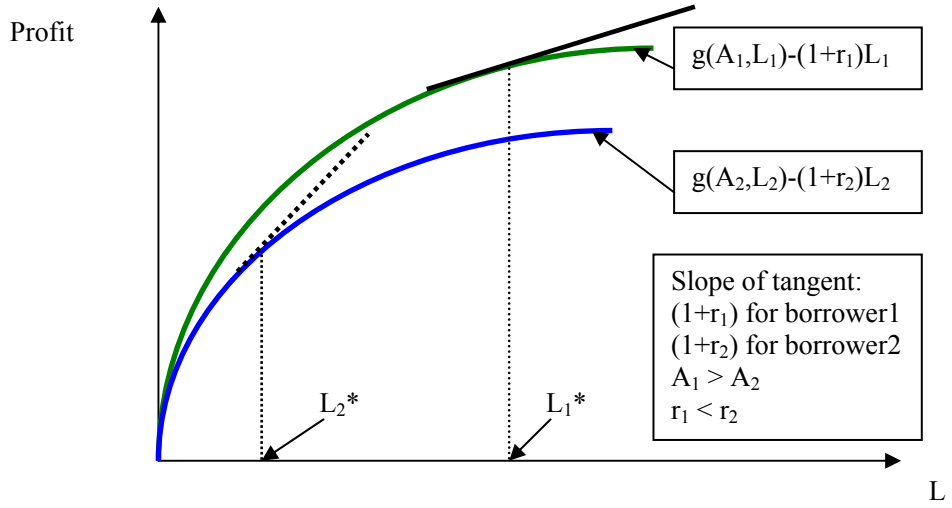

Figure 3.2: First best case: loan amounts for borrower 1 and 2 in equilibrium

Further , Zero profit condition of a bank implies

$$p(A)(1+r)L + (1-p(A))C(A) = (1+\rho)L$$

$$\Rightarrow \hat{r} = \frac{1+\rho-p(A)}{p(A)} - \frac{(1-p(A))C(A)}{p(A)L} \qquad \ldots(3.5)$$

In case of perfect information (first best) , the bank will set C = 0, since posting of collateral is costly and also risky to the borrower . Since when project fails, then collateral is transferred from a risk averse agent to a risk neutral agent - that amounts to net decrease of utility in aggregate ,i.e. collateralization leads to inefficient risk sharing.

Hence in the fisrt best case C = 0

$\Rightarrow \frac{\partial \hat{r}}{\partial p} < 0$; Also $\frac{\partial \hat{r}}{\partial A} = \frac{\partial \hat{r}}{\partial p} \cdot \frac{\partial p}{\partial A} < 0$. This also implies that

$$\Rightarrow \frac{\partial \mathrm{L}^*}{\partial \mathrm{p}} = \frac{\partial \mathrm{L}^*}{\partial \mathrm{r}} \cdot \frac{\partial \mathrm{r}}{\partial \mathrm{p}}\Big|_{\hat{r}} > 0$$

This equations says that, the (first best) optimal level of demand of size of loan is such that the marginal product of loan is equal to gross interest rate (i.e. marginal value= marginal cost) – which is a standard full information perfect competition result. Equation (3.5) implies that higher asset endowments lead to lower contractual interest

rate via higher p(A); and equation (3.4) suggests that higher p(A) and lower $\hat{r}$ both lead to higher amount of contracted loan in equilibrium. This observation is summarized in Result 3.1.

Result 3.1: In the first best case (no information asymmetry), a borrower with richer endowment set gets lower rate of contractual interest rate and higher amount of loan in equilibrium. The loan contract is characterized as K= $\{\hat{r}_i, 0, L^*_i\}$.

3.3.3. Cases of Adverse Selection

When the lender does not know the risk type of borrower, i.e. the lender does not know probability of success of project, then both the separating and pooling equilibria are possible. These cases are discussed below.

3.3. 3.1. Case 1: No use of Collateral

Now assume that the bank does not know the individual probability of success. It only knows its mean value for the pool of borrowers, which is $\bar{p}$. In the simplest case, assume that collateral is not used. Then the zero profit condition of the bank implies

$$\Rightarrow \bar{p}(1+\bar{r})L = (1+\rho)L; \qquad \Rightarrow \bar{r} = \frac{1+\rho-\bar{p}}{\bar{p}} \qquad \text{...(3.6)}$$

$$\text{Now if we compare } \bar{r} \text{ to } \hat{r} \text{ (first best)}: \begin{cases} \bar{r} > \hat{r} \text{ for } p(A) > \bar{p} : \text{ for good borrower} \\ \text{and } \bar{r} < \hat{r} \text{ for } p(A) < \bar{p} : \text{for bad borrower} \end{cases}$$

The borrower with richer asset endowments is considered as good here.

Subject to participation constraint by borrowers:

$$\max_{L_i} Eu(\pi_i) = p_i(A_i)U(g(A_i, L_i) + W_i - (1+r_i)L_i) + (1-p_i)U(W_i) \geq 0$$

Equation (3.6) implies that, good borrower (p > $\bar{p}$) cross subsidizes the bad borrowers (low p). But that compels the good borrower to reduce the amount of loan demanded, compared to that of first best case (equation 3.5) and hence the good borrower is type I

rationed; the bad borrower gets higher amount of loan compared to the first best case. This leads to an inefficient use of loanable funds. Also if the proportion of bad borrowers exceeds a critical limit, then good borrowers may not take the loan because the pooled interest rate may be too high to satisfy the participation constraint. Thus type II rationing is observed in pooling equilibrium. These observations are summarized in Result 3.2.

Result 3.2: In the case of adverse selection when collateral is not used, pooling equilibrium (K= { $\bar{r}$, 0, L_i}) contracts are offered. A common interest rate $\bar{r}$ is offered (L_i will differ across borrowers) and the good borrower cross subsidizes the bad borrowers and he will be type I rationed. Also if the proportion of bad borrowers exceeds a critical limit, then good borrowers may not take the loan because the pooled interest rate may be too high to afford and so he will be type II rationed. Thus in contrast with Stiglitz and Weiss (1981), under these set of assumptions pooling equilibrium with both type I and type II credit rationing can arise.

3.3. 3. 2. Case 2: Collateral as a signaling device

It is assumed that the good borrower will attempt to separate themselves by using collateral as a signaling device to get better terms of contract (lower interest rate and higher amount of loan). When collateral is used as a signaling device and that is used by the lenders for computation of contracts then signaling equilibria (Spence,1973) are attained. In general there are many signaling equilibria, some of which may be noncooperative Nash equilibria. But Rothschild and Stiglitz (1976) have shown, Nash equilibrium may fail to exist in the insurance market. This may also occur in credit markets, because of the commonality of assumptions considered related to information asymmetry. Hence the alternative and more restrictive concept of a Riley Reactive Equilibrium (Riley, 1979) is considered. This is an equilibrium from which lenders

will not deviate because; (i) reactions by other lenders to possible deviations make the latter unprofitable, and (ii) such reactions are always to be expected[6]. In this sense, the signaling equilibria, which I derive later, are guaranteed to exist as Reactive Equilibrium.

Further following the results of Rothschild-Stiglitz (1976) and Wilson (1977), that under asymmetric information Nash equilibria are never pooling, it can be said that in competitive credit market equilibrium (if it exists) distinct credit contracts will be offered by banks. The set of contracts $\{r_i, C_i, L_i\}$ are incentive compatible.

A good borrower provides collateral and pays a lower interest rate. The bad borrower pays a higher interest rate and provides no collateral, as it is riskier to post collateral with a higher default probability. Essentially each type of borrower gets a distinct contract in equilibrium suiting to his type. The zero profit equilibrium implies that no collateral is required from the most risky type. The most risky type receives the same contract as under perfect information. As there is no pooling of contracts, there is no cross subsidizing on interest rates and so there is no type II rationing. The good borrower may still be type I rationed. Type II rationing can occur only when wealth constraint binds and a separating equilibrium is not perfectly obtained.[7]

To obtain the signaling equilibria, the revelation principle (Myerson, 1979) is used. The loan contracts are designed such that, each type of borrower has no incentive to choose the contracts of other types. Hence

$$EU_i(\pi_i) \geq EU_i(\pi_j) : (\mathrm{IC_i}) \quad \text{and} \quad \mathrm{E}U_j(\pi_j) \geq EU_j(\pi_i) : (\mathrm{IC_j}) \; \forall \; \mathrm{i, j} \in (\text{set of borrowers})$$

$$\text{Where, } \mathrm{IC_i} \text{ is incentive compatibility constraints for borrower i} \qquad ...(3.7)$$

[6] Followed from, Louis (1988), 128-152, Besanko and Thakor (1987), and Schmidt- Mohr (1997).

[7] For details on these issues, see Bester (1987).

Where, $EU_i(\pi_i) = p_i(A_i)U_i(g(A_i, L_i) + W_i - (1+r_i)L_i) + (1 - p_i(A_i))U_i(W_i - C(A_i)) \geq 0$

and $EU_i(\pi_j) = p_i(A_i)U_i(g(A_i, L_j) + W_i - (1+r_j)L_j) + (1 - p_i(A_i))U_i(W_i - C(A_j))$

and $EU_j(\pi_j)$ *and* $EU_j(\pi_i)$ are analogously defined.

The individual rationality constraint is satisfied, i.e. $EU_i(\pi_i) \geq U_{reserve} \quad \forall i$

Also zero profit condition for the bank is satisfied for all contracts.

$p_i(A_i)(1+r_i)L_i + (1 - p_i(A_i))C(A_i) = (1+\rho)L_i$

Let us first characterize the marginal rate of substitution (MRS) for a borrower i, between any pair of contract parameters. Equation (3.7) suggests that the MRS between interest rate r, and loan size L, for a loan contract $K_i = \{r_i, C_i, L_i\}$ is given by

$$\eta_i^b(K \mid C)_{r,L} = \frac{dr_i}{dL_i} = -\frac{(\partial EU / \partial \pi_i)(\partial \pi_i / \partial L_i)}{(\partial EU / \partial \pi_i)(\partial \pi_i / \partial r_i)}$$

$$= \frac{g_L(A_i, L_i) - (1+r_i)}{L_i}, \qquad \forall i \in \text{(set of borrowers)} \qquad \text{...(3.8)}$$

In the first best case, the numerator is zero for all borrowers and so $MRS_{r,L}$ is perfectly elastic. In the presence of information asymmetry however it is not guranteed.

Further for $L < L^*$ (first best) it is positive, which implies that all borrowers are willing to pay higher interest rate for a fixed increase in the size of loan until the first best loan amount is attained. Further equation (3.8) suggests that, the borrower with higher endowments has higher value of g_L, hence $\eta_i^b(K \mid C) > \eta_j^b(K \mid C)$ for $A_i > A_j$. Hence type i with higher endowment level is willing to pay higher rate of interest for a fixed increase in the size of loan until the first best loan amount is attained, as marginal value of loan amount is higher because of complementary endowment effect. Similarly the MRS of a borrower i, for collateral C and the interest rate r is given by

$$\eta_i^b(K \mid L)_{r,C} = \frac{dr_i}{dC_i} = -\frac{(\partial EU/\partial \pi_i)(\partial \pi_i/\partial C_i)}{(\partial EU/\partial \pi_i)(\partial \pi_i/\partial r_i)}$$

$$= -\frac{1-p_i}{p_i}\frac{U'(W_i - C)}{U'(g(A_i, L) + W_i - (1+r)L)L} \quad \ldots(3.9)$$

Equation (3.9) implies that, for higher endowment borrower i ($A_i > A_j$ and so $p_i > p_j$) the absolute magnitude of $\eta_i^b(K \mid L)$ may be lower than $\eta_j^b(K \mid L)$ .This is possible when $\frac{1-p_i}{p_i}$ dominates. Hence, when p_i is sufficiently distinguishable from p_j ($p_i >> p_j$), the good borrower is willing to provide more collateral for a reduction in interest rate. The indifference curve of the good borrower is less steep in C-r space than for the bad borrower. It is assumed that the wealth constraint does not bind for posting of collateral.

But if the $\frac{1-p_i}{p_i}$ term does not dominate the other term, then the above possibility fails and the possibility of type II rationing (of good borrower) or a pooling equilibrium arises. A simple illustration will highlight the two scenarios. I assume $U(X) = X^{.5}$ and $g(A,L) = (AL)^{.5}$. The good borrower with higher endowments A is denoted as i and the bad borrower with lower endowments is denoted as j. The loan amount is computed for first best value, L=L*. Further it is assumed that collateral is C= 0.5*L (and C≤W). The realistic values of parameters and results are shown in Table 3.3. The last column of the table shows the values of equation (3.9) for both types of borrowers. Clearly for these probability values the good borrower is willing to post comparatively more collateral to get a fixed amount of reduction in interest rate.

Table 3.3: Demonstration of Willingness to Post Collateral

Probability Of Success	A	L	W	C	$U'(.)_{numerator}$	g(A,L)	$U'(.)_{denominator}$	dr/dC: Value Of eq.(3.9)
Good (i),p=0.7	20	4.14	5	2.06	0.29	9.09	0.16	0.18
Bad(j),p=0.4	10	2.06	5	1.03	0.22	4.5	0.18	0.98

Further using above parametric values the graph in Figure 3.3 neatly demonstrates these assertions; also the probability of success is computed as a monotonically increasing function of asset endowment, p(A) = a.exp(-10/A), where a is a normalizing constant. For an assumed value of W=5, the graph is plotted for A≥10. Clearly the absolute value of dr/dC is monotonically decreasing for $A \in [10,40]$. This range of A, from 2 times to 8 times of annual income is quite reasonable. Beyond that the wealth constraint on collateral posting is violated. Also it is seen that the higher the value of the productivity coefficient ψ on assets and loan, borrower is willing to post less collateral to get the same reduction in the interest rate.

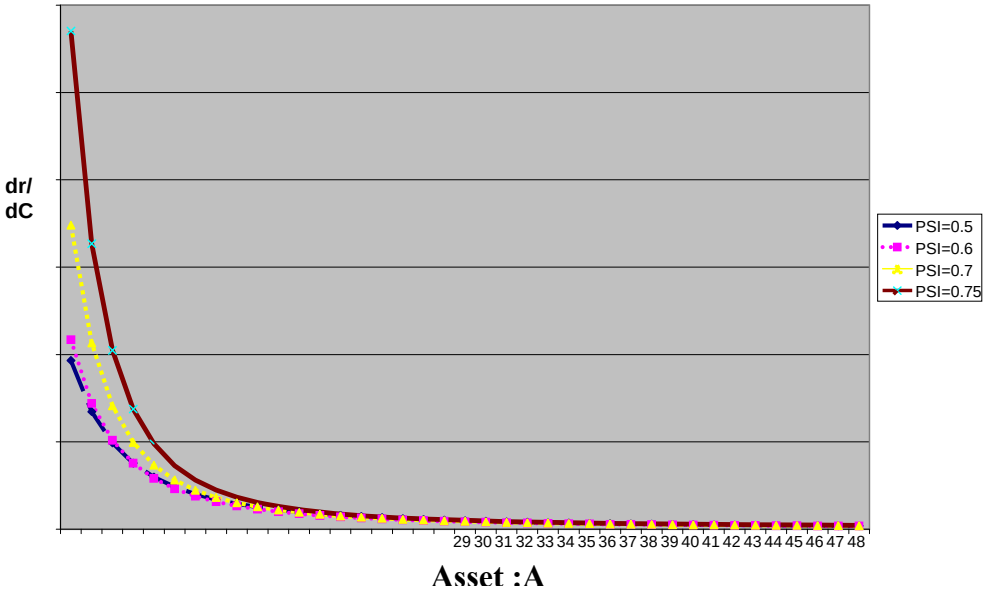

Figure 3.3: Willingness to Post Collateral: Equation (3.9)

The purpose of this exercise was to demonstrate that under reasonable circumstances the borrower with higher endowments would be willing to pay higher amount of collateral to obtain a fixed reduction in the interest rate.

Also, the MRS of bank, between r, and L for a contract K, for a borrower i, is given by

$$\eta_i^l(K \mid C)_{r,L} = \frac{dr_i}{dL_i} = -\frac{(\partial \pi^l{}_i / \partial L_i)}{(\partial \pi^l{}_i / \partial r_i)} = \frac{(1+\rho)/\, p_i - (1+r)}{L} \qquad ...(3.10)$$

$$\eta_i^l(K \mid L)_{r,C} = \frac{dr_i}{dC_i} = -\frac{(\partial \pi^l{}_i / \partial C_i)}{(\partial \pi^l{}_i / \partial r_i)} = -\frac{1 - p_i}{p_i L} \qquad ...(3.11)$$

Comparing equation (3.11) and equation (3.9) and using zero profit condition, it can be shown that, $| \eta_i^l(K \mid L)_{r,C} | < | \eta_i^b(K \mid L)_{r,C} |$, i.e. banker's isoprofit curve is flatter than the borrower's indifference curve in C-r space. This observation in conjunction with that of equation (3.9) suggesting that indifference curves of good borrower is flatter than that of bad borrower (single crossing property) is important. It leads to a set of separating equilibrium. The good borrower posts higher collateral and pays lower rate of interest, which is opposite to the preference of bad borrower. But when the necessary conditions of wealth constraint is not binding on collateral and single crossing property does not hold (which has a reasonable possibility) then a perfect separating equilibrium may not be obtained and type II credit rationing may be obtained in equilibrium.

Further comparing equation (3.8) and (3.10) implies that

$\eta_i^l(K \mid C)_{r,L} = \eta_i^b(K \mid C)_{r,L}$; iff $g_L(A,L) = (1+\rho)/\, p_i$, i.e. expected marginal value of project equals marginal cost of the project.

3.3.3.3 Sketch of Solution of Truth Revealing Program (3.7)

A sketch of solution of truth revealing program (3.7) is presented in Appendix 3.1, therein equations– 3.12, 3.13, 3.15, 3.16, and 3.17 simultaneously determine r, C, L, and constraint coefficients. The equation (3.17) (reproduced below) helps in pinning down the equilibrium value of L_i(index i here denotes good borrower).

The first order derivative with respect to L_i of the program (3.7) yields

$$p_i U'(g(A_i, L_i) + W_i - (1+r_i)L_i)[g_L(A_i, L_i) - (1+r_i)] =$$

$$p_j \lambda_2 [U'(g(A_j, L_i) + W_j - (1+r_i)L_i)[g_L(A_j, L_i) - (1+r_i)] - \lambda_1 [p_i(1+r_i) - (1+\rho)] \quad ..(3.17)$$

Since $p_i(1+r_i) < (1+\rho)$, second term on Right hand side is positive. But sign on the first term on the right hand side is indeterminate. Becuase the bad borrower j gets her first best contract, hence $g_L(A_j, L_j) - (1+r_j) = 0$, but with $r_i < r_j$, and $A_i > A_j$

$g_L(A_j, L_i) - (1+r_i)$ can be positive or negative.

This causes three possibilities for the loan amount.

Possibility1: If both terms on right hand side of equation (3.17) are positive, then, $g_L(A_i, L_i) - (1+r_i) > 0$. Hence the equilibrium value of loan size for good borrower will be less than compared to perfect competition (MV=MC) value. However as $\hat{r}_{i\ \text{signal}} < \hat{r}_{i\ \text{first bestl}}$, the loan size for her in the signaling equilibrium may be bigger or smaller than that of first best.

Possibility 2: If the first term is negative and dominates the second term (which is positive), then $g_L(A_i, L_i) - (1+r_i) < 0$. This is possible when L_i is sufficiently higher than L_j. Hence the equilibrium value of loan size for good borrower exceeds than that in perfect competition.

Possibility 3: If the first term is negative and smaller than the second term (which is positive), then $g_L(A_i, L_i) - (1+r_i) > 0$. Hence equilibrium loan size for good borrower is again smaller compared to that of in perfect competition. However, as mentioned in possibility 1 the loan size may be bigger or smaller that that of the first best solution.

Hence, $\hat{L}_{i\ \text{signal}} > \hat{L}_{i\ \text{first best}}$ or $\hat{L}_{i\ \text{signal}} < \hat{L}_{i\ \text{first best}}$

In the first case the good borrower uses collateral to her advantage to get more loan compared to the first best value. However in the second case she gets less than the first best case and hence is type 1 rationed.

Thus loan size is used as a screening device. The good type is more willing to pay higher interest rate to get higher loan (equation 3.8), however to get the separating equilibrium, the bank's optimal strategy does not allow that, as the bad borrower could mimic the good borrower. These observations are summarized in the Result 3.3.

Result 3.3: In the case of adverse selection, if wealth constraint on collateral is not binding, then collateral can be used as a signaling device yielding non rationing (type II) separating equilibria. The bad borrower gets the first best contract, whereas the good borrower posts collateral to bargain for lower interest rate – but their loan size may be larger or smaller than that of the first best solution. In the latter case good borrower is type I rationed. If the wealth constraint is binding, then perfect-separating equilibria (distinct contracts for all types) may not be obtained resulting in pooling equilibria with both types of rationing.

This is demonstrated in Figure 3.4. The good borrower (index 1) gets contract A, and the bad borrower (index 2) gets contract B, such that $r_1 < r_2$ and $C_1 > C_2$. This demonstrates a separating equilibrium. Good borrower needs to post collateral C_1, to separate himself from bad borrower.

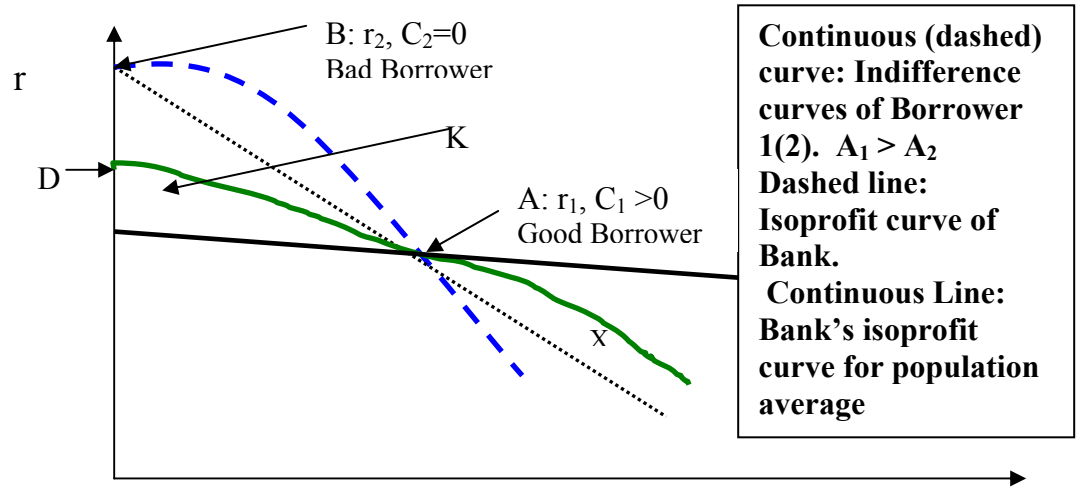

Figure 3.4: Signaling Equilibrium: Separating Equilibrium obtained using Collateral

The point D cannot be an equilibrium because bad one also likes that, but the bank will incur loss if such pooling contract is offered. Also bad borrower is indifferent between the contracts at A and B, but he can not pool at A, since then the bank can offer a contract at X, which is liked by both the good borrower and the bank – thus the pooling equilibrium at A will also not survive. Hence the only equilibrium that survives is the set of separating equilibria at A and B. The bad borrower receives the same contract as under perfect information.

However the values of parameters may be such that the above described separating equilibrium may not be achieved, then the pooling equilibrium as described earlier may be obtained and that may lead to both type I and type II rationing.

Further it can be shown that Nash equilibrium may not exist altogether. In figure 3.4, if the black continuous line is bank's iso-profit curve for the population average, then the pair of contracts A and B cannot be a separating equilibrium. There exits a pooling contract as shown by K. The contract K is liked by both type of borrowers and also by the bank. The possibility of this increase as the proportion of good borrower increases. Hence the existence of pair of separating equilibrium is guaranteed only if the proportion of good borrowers is less than a critical value γ^*. This leads to result 3.4.

But as shown by Rothschild and Stiglitz (1976) a pooling Nash equilibrium does not exist. To overcome the nonexistence problem of Nash equilibrium, concept of Riley Reactive Equilibrium is used. The deviating lender would take into account that the competing banks would react by offering additional profitable contracts and if that implies the loss for the first bank, then it would not offer such deviating contract in the first place. So in such a framework the Reactive equilibrium is always separating (A, B). This discussion leads to the following result.

Result 3.4: Under suitable parametric assumptions, the separating signaling equilibrium is obtained only if the proportion of good borrowers is less than a critical

value γ*. However if the concept of RRE is used then the separating equilibrium always survives.

Results 3.3 and 3.4 are demonstrated neatly in L- r plane with the help of Figure 3.5.

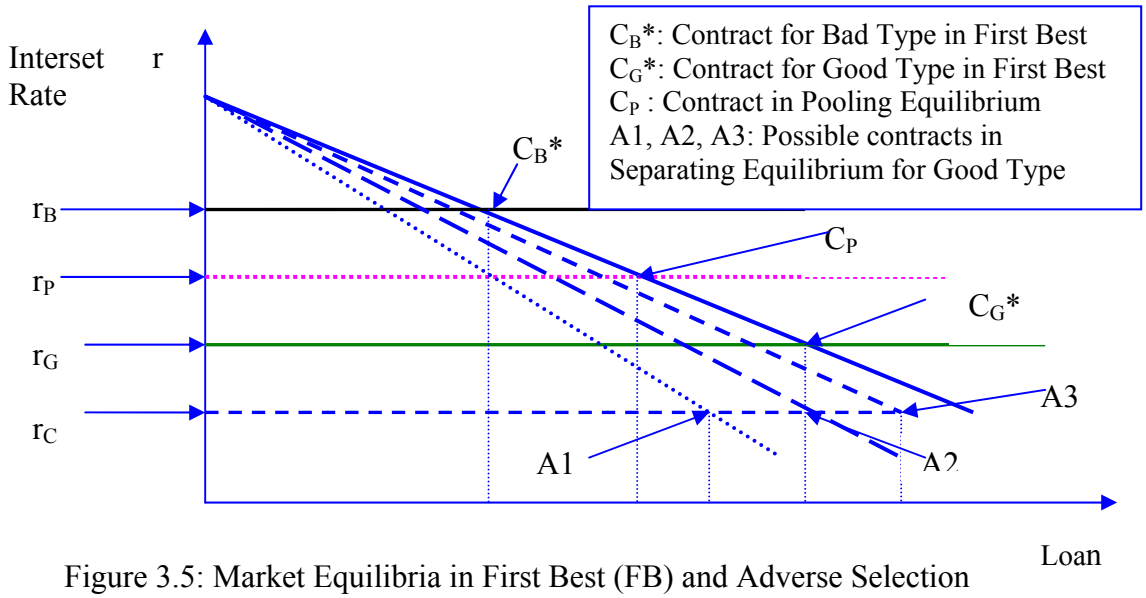

Figure 3.5: Market Equilibria in First Best (FB) and Adverse Selection Condition

The continuous blue line is demand curve of loan for both types of borrowers. It follows from equation (3.4) (which is hyperbolic), but a downward sloping line is used for simplicity of demonstration without distorting the results. Furthermore, a single demand curve has been used for both good and bad type of borrowers; again this is for simplicity. As evident from equation (3.4) demand curve for bad type of borrower with less assets (A) will be actually steeper, that will strengthen the depiction of results. The continuous horizontal lines are supply curves of loan for different types of borrowers in the first best case. This follows from equation (3.5). The short dashed horizontal line is supply curve under adverse selection set up for pooling equilibrium. This follows from equation (3.6).

In the first best situation the good type gets contract C_G* (lower r* and higher L*) and the bad type gets contract C_B*(higher r* and lower L*). In the adverse selection set up

there are two possibilities- a pooling equilibrium and a separating equilibrium. In the case of a pooling equilibrium (no collateral is used) both types of borrowers get same contract C_P, which follows from equation (3.6). Clearly good type borrower cross subsidizes the bad type borrower and incurs a welfare loss.

But when collateral is used as a signaling device; signaling equilibria (separating in nature) are obtained as predicted by equations (3.8 -3.17: derived in Appendix 3.1). The bad borrower continues to get the first best contract at C_B*. The good borrower posts collateral and bargains for lower interest rate as predicted by equation (3.13), hence she faces a perfectly elastic supply curve r_C shown by long dashed horizontal line. Also her demand curve rotates inside (steeper) as predicted by equations (3.3 and 3. 13), as for same amount of loan she needs to pay a lower interest rate. Now depending upon the amount of tilt the good type of borrower gets either contract A1 (L<L*), or contract A2 (L=L*), or contract A3 (L>L*). If the good borrower gets contract A1 then evidently she is type I rationed.

3.3.4. Strategic Default and Limiting the Loan Size

So far the asymmetric information problem in credit market has been analyzed in terms of hidden types of borrowers. But it may also come from hidden actions of the borrower – normally known as moral hazard. If a borrower gets loan larger than a certain value such that defaulting is rational, then she will strategically default. The bank is aware of such incentive problem and seeks an equilibrium on an amount of loan $L_{restrict}$, such that the borrower is indifferent between repaying the loan or defaulting. Thus loan size is used as an incentive device to resolve the problem of strategic default. Now if $L_{restrict}$, turns out to be less than L*, then type I rationing is observed. In this section I demonstrate the economics of moral hazard using

comparative analysis of net utility gain from repaying the loan or defaulting on the loan in an infinite time horizon set up.

The maximum utility the borrower can get from defaulting is

$$\beta[pU(g(A,L)+W-C)+(1-p)U(W-C)+\frac{\beta}{1-\beta}U(W)]$$

On the other hand, the minimum the borrower gets from perfect repayment is the discounted present value of utility, V(L) over an infinite horizon of lending and borrowing relationship. Participation constraint of the borrower is assumed to be satisfied for loan size more than and equal to a cut off value of $\hat{L}$.

$$pU(g(A,\hat{L})+\mathrm{W}-(1+r)\hat{L})+(1-p)U(\mathrm{W}-C(A))=\bar{U}$$

The condition for no strategic default is :

$$\mathrm{V}(\bar{\mathrm{L}})_{\mathrm{t=1}}^{\mathrm{t}=\infty}\geq\beta[pU(g(A,L)+W-C)+(1-p)U(W-C)+\frac{\beta}{1-\beta}U(W)] \qquad \ldots(3.18)$$

$$\text{Where } \mathrm{V}(\bar{\mathrm{L}})_{\mathrm{t=1}}^{\mathrm{t}=\infty}=\sum_{t=1}^{t=\infty}\beta^{t}(pU(g(A,L)+\mathrm{W}-(1+r)L)+(1-p)U(\mathrm{W}-C(A))$$

$$V(\bar{\mathrm{L}})_{\mathrm{t=1}}^{\mathrm{t}=\infty}=\frac{\beta}{1-\beta}(pU(g(A,L)+\mathrm{W}-(1+r)L)+(1-p)U(W-C(A))$$

Hence, $$\frac{\beta}{1-\beta}(pU(g(A,L)+\mathrm{W}-(1+r)L)+(1-p)U(W-C(A)))\geq$$

$$\beta[pU(g(A,L)+W-C)+(1-p)U(W-C)+\frac{\beta}{1-\beta}U(W)]$$

Hence, $$p\{U(g(A,L)+\mathrm{W}-(1+r)L)-(1-\beta)U(g(A,L)+W-C)\}\geq$$

$$\beta U(W)-\beta(1-p)U(W-C) \qquad \ldots(3.19)$$

Equation (3.19) gives a ceiling on L such that strategic default is not obtained. The left hand side of equation (3.19) essentially shows extra gain in utility by not defaulting while the right hand side shows extra gain in utility by defaulting in an infinite time horizon framework. The above equation is analytically characterized as following.

1. For reasonable values of parameters, assets endowment, income in every period, amount of loan L, and collateral C subject to satisfaction of wealth constraint; the left hand side (L.H.S.) of the equation (3.19) will be concave. It is demonstrated as following.

The first order derivative of L.H.S. with respect to L is (for $W \geq C$)

$$p\{U'(g(A,L) + W - (1+r)L)(g(.)_L - (1+r)) - (1-\beta)U'(g(A,L) + W - C)(g(.)_L - .5)\}$$

and the second order derivative of this with respect to L is (for $W \geq C$)

$$p\{U''(g(A,L) + W - (1+r)L)(g(.)_L - (1+r))^2 + U'(.)g_{LL}\} -$$

$$p(1-\beta)\{U''(..)(g(.)_L - .5)^2 + U'(..)g_{LL}\}$$

Because of concavity assumptions on U (.) and g (.) the terms in both parentheses are negative. However for reasonable parametric assumptions the first one is likely to dominate in magnitude and thus the second order derivative of left hand side of equation (3.19) at all points in the domain of reasonable values of L will be negative and hence it will be concave for such values of L. This is shown in Figure 3.6.

2. The right hand side of the equation (3.19) is strictly convex in L and monotonically rising in L, as depicted in figure 3.6. It is shown as follows:

The right hand side of the equation (3.19) is $= \beta U(W) - \beta(1-p)U(W-C)$

Taking first order derivative with respect to L of this

$$= \beta(1-p)U'(W-C)(\partial C / \partial L) > 0$$

Now taking second order derivative with respect to $L \Rightarrow$

$$= -\beta(1-p)U''(W-C)(\partial C / \partial L)^2 > 0$$

3. Since the L.H.S. of equation (3.19) is concave in L and the R.H.S. of the equation is monotonically rising in L and convex in L, there exists an internal L (which is $L_{restrict}$)

such that the inequality of equation (3.19) is violated above $L_{restrict}$. This observation is shown in Figure 3.6.

4. Even if the L.H.S. of equation (3.19) for very large values of A is not concave, then because the R.H.S. of the equation is monotonically rising and convex in A, it will exceed the L.H.S. of the equation for some value of L and thus $L_{restrict}$ will always be obtained.

Hence under most reasonable conditions the lender will not provide a loan beyond $L_{restrict}$, since that will induce the borrower to strategically default on the loan.

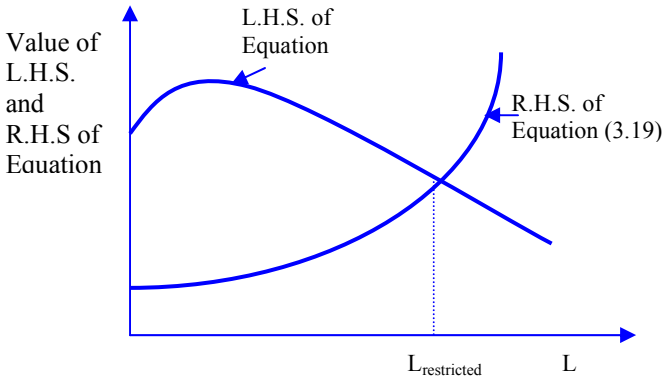

Figure 3.6: Loan Amount Restriction Due to Moral Hazarded

These observations are neatly demonstrated with the help of Figure 3.6. Again the utility function is assumed to be $U(X) = X^{.5}$ and production function is $g(A,L) = (AL)^{.5}$. The values of parameters assumed are; β=.8, p=.7, ψ=(.5 ,.4), A=40, and r=.1. Further it is assumed that collateral is C= 0.5*L (and C≤W). The value of income endowment in every period is assumed as W=10 and loan amount approved – L is at most two times of W , and collateral C is 50 percent of loan amount subject to satisfaction of wealth constraint. Evidently the R.H.S. of equation (3.19) crosses the L.H.S. of the equation L=17.5. Hence under this scenario $L_{restrict}$ =17.5, wheras L*(first best) = 8.26 – so for these parametric values type I rationing is not observed.

Further as observed from the Figure 3.7 the value of $L_{restrict}$ decreases with lower value of productivity coefficient (ψ) of capital. Now comparing with the first best scenario, we get

$L^* = (\frac{\psi A}{1+r})^{\frac{1}{1-\psi}}$; And $L_{restrict}$ can be computed solving the implicit function

$h(L_{restrict}; \beta, \psi, r, p, C, A) = 0$, which follows from equation (3.19). Further, it can be shown that

$$\frac{\partial L_{rest}}{\partial A} > 0; \frac{\partial L_{rest}}{\partial \beta} > 0; \frac{\partial L_{rest}}{\partial r} < 0; and \ \frac{\partial L_{rest}}{\partial p} > 0 \ ; \forall A > 0, 0 < \beta < 1, r > 0, 0 < p < 1 \quad ...(3.20)$$

Where r is obtained from zero profit condition of the bank.

Figure 3.7: Loan Amount Restriction Due to Moral Hazard.

Further it is shown in table 3.4 that $L_{restrict}$ decreases with lower values of β (patience factor) and also it decreases with lower value of probability of success p. It is also evident that for specific lower values of β or p, $L_{restrict} < L^*$ is obtained and hence type I rationing is attained in equilibrium. This leads to Result 3.5.

Table 3.4: Variation of $L_{restrict}$ and L* with respect to β and p

Beta ,β	$L_{restrict}$ *(for p=0.7)*	*L**	*Probability of success ,p (for β=.8)*	$L_{restrict}$
0.8	17.5	8.26	0.8	19.5
0.7	14.5	8.26	0.7	17.5
0.6	13.5	8.26	0.6	13.5
0.5	11.5	8.26	0.5	10.5
0.4	**8.5**	**8.26**	**0.4**	**8**
0.35	7.5	8.26	0.3	5.5
0.3	6.5	8.26		

Result 3.5: The lender uses the loan size as an incentive device to resolve the strategic default problem. If the restricted loan size for a borrower is less than the first best value then the borrower is type I rationed. The limit on loan size is found to be an increasing function of the borrower's patience factor β, and her endowment vector. Hence the borrowers who are poor in endowment and impatient (lower β) obtain smaller loans as a consequence of type I rationing. This is shown in Figure 3.8.

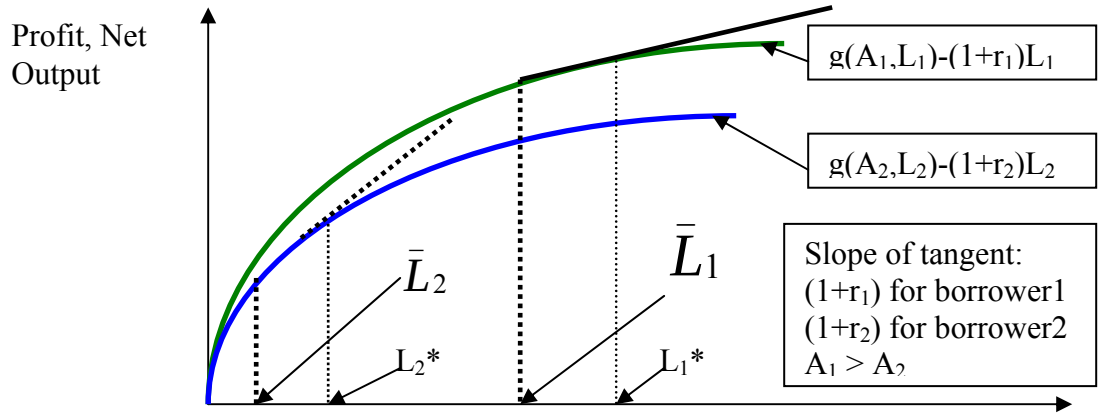

Figure 3.8: Strategic Default: Type I Credit Rationing in equilibrium

3.3.5 Incentive Problem in Infinite Horizon Setup[8]

Above strategic default analysis can be further formalized using equation (3.19) as following. Reversing the inequality sign of equation (3.19), condition for strategic default is obtained as following

$$p\{U(g(A,L)+\mathrm{W}-(1+r)L)-(1-\beta)U(g(A,L)+W-C)\}\leq$$
$$\beta U(W)-\beta(1-p)U(W-C) \qquad ...(3.20)$$

Further shuffling the terms, condition for strategic default obtained is:

$$\Rightarrow p\{(1-\beta)U(g(A,L)+W-C)-U(g(A,L)+\mathrm{W}-(1+r)L)\}\geq$$
$$\beta\{(1-p)U(W-C)\text{ - U(W)}\} \qquad ...(3.20)$$

$$\Rightarrow \mathrm{p}\{(1-\beta)U(Y-C)-U(Y-R)\}\geq \quad \beta\{(1-p)U(W-C)\text{ - U(W)}\} \qquad ...(3.21)$$

Here, Y= net income in current period inclusive of endowments and project income, and R=(1+r)L = repayment obligations. Equation (3.21) basically suggests that if net gains from not repaying in the current period are larger than the discounted sum of values of net gain from not defaulting for all future periods, then it is optimal to default in present

Now equation (3.21) can be conveniently written in the following modified form.

$$\phi(Y,R)=p\{(1-\beta)U(Y-C)-U(Y-R)\}\geq\beta\{(1-p)U(W-C)\text{ - U(W)}\} \qquad ..(3.22)$$

Here $\phi(Y,R)$ can be considered as an index function, which represents a propensity to default on the loan strategically.

The first term on the left hand side is multiplied by (1-β) that may be equal to 0.1 or so, which makes this term quite small in comparison to the second term, even though collateral amount is less than repayment obligations. Further, U (.) is a strictly concave function; these conditions imply that

[8] Discussion here benefits from Allen (1983), and Eaton and Gersowitz (1981), and Frexias, Xavier and Rochet, Jean – Charles (1997).

$$\frac{\partial \phi}{\partial Y} < 0; \quad \text{and} \qquad \frac{\partial \phi}{\partial R} > 0 \qquad \text{...(3.23)}$$

Also the condition of equation (3.22) will hold iff Y is less than a critical value $\bar{Y} = \upsilon(R)$. Since at $Y = \bar{Y} = \upsilon(R)$,

$\phi(Y, R) = \phi(\upsilon(R), R) = \phi(Y, R) = \beta\{(1-p)U(W-C) - \mathrm{U(W)}\}$

$$\Rightarrow \frac{\partial \phi}{\partial Y}\frac{\partial \upsilon}{\partial R} + \frac{\partial \phi}{\partial R} = 0; \;\Rightarrow \frac{\partial \upsilon}{\partial R} = -\frac{\partial \phi}{\partial R} \Big/ \frac{\partial \phi}{\partial Y} \qquad \text{...(3.24)}$$

Using equation (3.23), it implies that

$$\frac{\partial \phi}{\partial Y} < 0; \; \frac{\partial \phi}{\partial R} > 0 \; ; \qquad \text{and hence } \frac{\partial \upsilon}{\partial R} > 0 \qquad \text{...(3.25)}$$

Equation (3.25) suggests that likelihood of strategic default increases as R i.e. repayment obligation (loan size, interest rate) increases or also when the Y the project output decreases. These observations are summarized in Result 3.6.

Result 3.6: The borrower chooses to strategically default on the loan, when current output from the project is low compared to the repayment obligations. And the likelihood of strategic default increases with the quantity of repayment obligations.

3.4. Welfare Implications of Credit Rationing

The presence of asymmetric information among borrowers and lenders violates the completeness assumptions of credit market resulting in equilibrium outcomes that can be Pareto inefficient[9]. In the perfect competition framework loan is allocated such that marginal benefit (MB) of investing this loan equals its marginal cost (MC). But when credit rationing takes place, the MB is greater than MC introducing an efficiency loss. In the perfect competitive environment the equilibrium allocation needs to satisfy three necessary conditions; (i) Profit maximization by each firms, (ii) Utility

[9] Followed from Mas-Colell, Whinston and Green (henceforth MWG), 1995 – Chapter 10.

maximization by each consumers, and (iii) Market clearing for each good. However in the incomplete market set up, additional constraints need to be satisfied. For example in the case of adverse selection, the incentive compatibility constraint of the bad borrower binds in equilibrium in addition of satisfying of incentive compatibility and participation constraints of all agents. Similarly in the case of moral hazard the above constraints need to be satisfied and often these constraints bind. These additional constraints lead to a set of admissible allocations, which is a subset of the allocations that are available in the case of perfect competition. Hence the equilibrium allocations in incomplete market are Pareto dominated by that of perfect competition.

3.4.1. A Simple Analysis of Welfare Loss

The measure of social welfare used here is aggregate surplus; the sum of surplus earned by the borrower and the lender. This measure of social welfare is justified under the assumption that markets for other goods are competitive[9]. As mentioned earlier the borrower earns profit π from undertaking the project when it is successful with probability p (A). In the case of failure he loses the collateral.

Following from equation (3.2);

$$\text{Borrower surplus (BS)} = \text{p}\pi + (1-p)(-C) = p(g(A, L) - (1+r)L) + (1-p)(-C)$$

Where, $g(A_i, L_i) = (A_i L_i)^{\psi}; 0 < \psi < 1$

$$\text{Similarly the Lender surplus (LS)} = p(A)(1+r)L + (1-p(A))C(A) - (1+\rho)L$$

Where ρ is the cost of capital at which the bank raises funds in the competitive market

Furthermore, Zero profit condition of a bank implies, Lender Surplus = 0.

Also the zero profit condition determines equilbrium interst rate;

$$\Rightarrow \hat{r} = \frac{1+\rho-p(A)}{p(A)} - \frac{(1-p(A))C(A)}{p(A)L}$$

Aggregate surplus, $AS(L) = BS + LS = p(g(A,L) - (1+r)L) + (1-p)(-C)$ ...(3.26)

As g(A,L) is a concave function in L, so AS(L) is also a concave function in L.

As discussed earlier, posting of collateral is inefficient in perfect competition : $\Rightarrow C = 0$

L* is defined as Pareto optimal loan amount which maximizes this aggregate surplus.

Hence, $L^* = \arg\max_{L}\{p(g(A,L) - (1+r)L)\}$

$\Rightarrow p(g_L(A,L^*) - (1+r)) = 0.$ $\Rightarrow \psi A^{\psi}(L^*)^{\psi-1} = 1+r$; Where $r = \hat{r} = \frac{1+\rho-p(A)}{p(A)}$

$$\Rightarrow L^* = \left(\frac{\psi A^{\psi}}{1+r}\right)^{\frac{1}{1-\psi}}; \qquad \text{...(3.27)}$$

It is evident that (L*,r) derived here is same as derived in equation (3.4); which shows that in perfect competition the equilibrium allocation is Pareto optimal.

Now it is assumed that there are two types of borrowers in the economy; good borrowers with success probability p constitute μ fraction of the economy and bad borrowers with success probability q (p>q) constitute 1- μ fraction of the economy. The Aggregate surplus for good borrower is computed as

$$AS_{L^*} = p\{(AL^*)^{\psi} - (1+r)L^*\} = pL^*\{A^{\psi}L^{*\psi-1} - (1+r)\} = pL^*\left\{\frac{1+r}{\psi} - (1+r)\right\}$$

$$\Rightarrow AS_{L^*} = pL^*\{(1+r)(1-\psi)/\psi\} = p\psi^{\frac{\psi}{1-\psi}}A^{\frac{\psi}{1-\psi}}(1+r)^{-\frac{\psi}{1-\psi}}(1-\psi) \qquad \text{...(3.28)}$$

Furthermore, $\frac{\partial AS_{L^*}}{\partial L^*} > 0$; $\frac{\partial AS_{L^*}}{\partial p} > 0$; $\frac{\partial AS_{L^*}}{\partial r} < 0$; and $\frac{\partial AS_{L^*}}{\partial A} > 0$

So the combined aggregate surplus for both good and bad borrowers is

$$AS_C^* = (1-\psi)\psi^{\frac{\psi}{1-\psi}}\{\mu p(A_G^{\psi})^{\frac{1}{1-\psi}}(1+r_G)^{-\frac{\psi}{1-\psi}} + (1-\mu)q(A_B^{\psi})^{\frac{1}{1-\psi}}(1+r_B)^{-\frac{\psi}{1-\psi}}\} \quad \text{...(3.29)}$$

where $A_G > A_B$; $r_G < r_B$; and $p > q$. This can be further simplified (by using E values of r_G and r_B)

$$AS_C^* = (1+\rho)^{-\frac{\psi}{1-\psi}}(1-\psi)\psi^{\frac{\psi}{1-\psi}}\{\mu(A_G^{\psi})^{\frac{1}{1-\psi}}(p)^{\frac{1}{1-\psi}} + (1-\mu)(A_B^{\psi})^{\frac{1}{1-\psi}}(q)^{\frac{1}{1-\psi}}\} \quad \text{...(3.30)}$$

quation (3.28) shows that aggregate surplus is linearly increasing in L*. Hence if L* is restricted in the asymmetric information set up because of additional binding constraints then aggregate surplus decreases and net loss of social welfare occurs. It

further shows that AS is linearly increasing in p (probability of success), and nonlinearly decreasing in r, the interest rate charged to the borrower. Hence the policies which help in increasing p and reducing r can be welfare improving.

3.4.2 Welfare Loss in the case of Adverse Selection

When the type of borrower is not known to the lender, then as analyzed in the foregoing section, both pooling equilibrium and separating equilibrium are possible, depending upon whether the wealth constraint is binding on collateral posting ability or not. Welfare evaluations are conducted next for these two possibilities.

3.4.2.1. Wealth Constraint Binding on Collateral

It has been seen that when the wealth constraint is binding on collateral then a separating equilibrium may not be obtained. Consequently a pooling equilibrium may be obtained – in which the interest rate faced by the good borrower is higher than that for perfect competition. The interest faced by all borrowers is same, i.e. $\bar{r} = \frac{1+\rho-\bar{p}}{\bar{p}}$ and $r_G < \bar{r} < r_B$. Using Equation (3.30) the aggregate social welfare is computed as

$$AS_C^{a1} = (1-\psi)\psi^{\frac{\psi}{1-\psi}}(1+\bar{r})^{-\frac{\psi}{1-\psi}}\{\mu p(A_G^{\psi})^{\frac{1}{1-\psi}} + (1-\mu)\, q(A_B^{\psi})^{\frac{1}{1-\psi}}\} \qquad ...(3.31)$$

Now if p is distinctly larger than q (in case of $A_G >> A_B$) then the welfare loss sustained by good borrower in magnitude may be bigger than welfare gain made by the bad borrwer and so $AS_C^{a1} < AS_C^{*}$.

Also this allocation is Pareto inefficient, with the good borrower suffering net surplus loss. There is net efficiency loss as the bad borrower gets more than Pareto optimal loan and the good borrower gets less than the Pareto optimal loan amount. Moreover if μ is sufficiently small, then $\bar{r}$ will be large such that the good borrower's participation

constraint is violated and she drops out of the credit market. In such a scenario only bad borrowers are left in the credit market and now

$$AS_C^{a2} = (1-\psi)\psi^{\frac{\psi}{1-\psi}}\{(1-\mu)\, q(A_B^{\psi})^{\frac{1}{1-\psi}}\ (1+r_B)^{-\frac{\psi}{1-\psi}}\} \qquad ...(3.32)$$

Clearly $AS_C^{a2} < AS_C^*$

3.4.2.2 Wealth Constraint not binding on Collateral

When wealth constraint does not bind for collateral posting, then a perfect separating equilibrium is obtained. The bad borrower gets a first best contract (without collateral) and suffers no welfare loss. The good borrower posts collateral and obtains a loan at the lower interest rate

$$\hat{r} = \frac{1+\rho-p(A)}{p(A)} - \frac{(1-p(A))C(A)}{p(A)L} \quad .$$

Further as discussed therein the loan amount obtained by good borrower may be smaller, equal or larger than that of first best. Hence signaling may lead to Pareto improvement or worsening for good borrower. Overall the net effects of signaling activities are ambiguous. However, the good borrower needs to post costly collateral to differentiate himself from the bad borrower, which may reduce his net surplus, as shown following.

$$(AS)_c^{a3} = AS_B^* + AS_G = AS_B^* + p(g(A,L) - (1+r)L) + (1-p)(-C) \qquad ...(3.33)$$

Now the AS_G has one additional negative term because of collateral posting and this may potentially make $(AS)_c^{a3} < AS_C^*$.

This implies that the aggregate surplus is strictly lower than that of the perfect information model and hence it is a second best solution.

3.4.3. Welfare Loss in the case of Moral Hazard

As discussed earlier, the lender may restrict the loan size for a borrower such that the borrower is not tempted to strategically default on loan at a later date. Here usually

both the participation constraint and incentive constraint binds. Now if the restricted loan size for any type of borrower is lower than that of the first best solution, then again the net aggregate surplus is reduced leading to net welfare loss.

Hence if $L_{Restrict} < L^*$, for any type of borrower(good or bad) then

$AS_C^M < AS_C^*$: where AS_C^M denotes aggregate surplus in moral hazard set up ...(3.34)

In other words credit rationing reduces overall welfare.

These observations can be neatly shown with the help of Figure 3.9. The continuous curve is AS curve (say for good borrower) under perfect competition and the dashed curve is AS curve under adverse selection set up. As discussed earlier it is quite possible that for the good borrower the loan size approved under adverse selection (L_{As}) and moral hazard (L_M) will be smaller than L* , i.e. $L_{As} \leq L^*$ and also $L_M \leq L^*$. As a result aggregate surplus obtained under adverse selection (AS_{As}) and moral hazard (AS_M) framework are less than that of perfect competition (AS*).

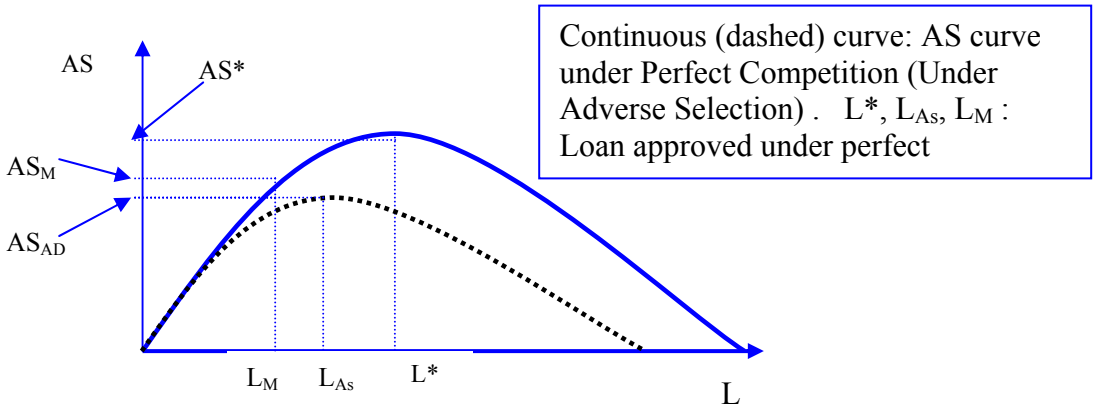

Figure 3.9: Aggregate Surplus under Different Market Conditions

These findings are summarized in Result 3.7.

Result 3.7: Using aggregate surplus (borrower surplus plus lender surplus) for the measure of social welfare, it is found that aggregate surplus value under adverse

selection or moral hazard conditions are strictly less than compared to the value obtained in perfect competition. Hence credit rationing reduces overall welfare. The policies which help in reducing information asymmetry may be welfare enhancing. Also the policies which help in increasing success probability q and reducing interest rate r can be welfare improving.

3. 4.4 Interest Rate Elasticity of Loan Demand

Price elasticity of loan demand has useful policy implications. Whether the demand for loan is price elastic or inelastic i.e., whether 1 percent reduction of the interest rate will lead to increase in demand of loan by more than 1 percent or less than this; whether the price elasticity value is uniform across all sections of people or it varies depending on assets endowments - these are some of the important policy questions.

One earlier study by Weersink et al (1994) estimated the demand for agricultural credit in the USA using a dynamic duality approach that provided estimates of short run (inelastic) and long run (elastic) elasticities. Recently a renewed interest has developed to investigate these matters particularly related to rural credit markets. Dehejia et al (2007) in context of their studies of microfinance related credit market in Bangladesh, found the interest elasticities of loan demand ranging from (-0.73 to -1.04). They also found that less wealthy borrowers are more price responsive than wealthier borrowers. Whereas, Karlan and Zinman (2006) found the credit demand to be highly price sensitive in context of their studies in a South African Microfinance credit market. However, their result is based on a randomized experiment that estimates demand curve by using mail solicitation method rather than using the actual field data.

Both these papers are empirical in nature and no analytical expression has been developed to estimate the price elasticity of loan demand. Benefitting from the

analytical framework developed in section 3, an expression for that is developed here. As close form solutions of loan demand for adverse selection and strategic default scenarios are cumbersome to obtain, the analysis is presented here for the first best i.e. perfect competition case. This may provide valuable insights into the above queries for the cases where information asymmetry can not be ignored.

The expression for price elasticity is developed using the loan demand and supply equations of the perfect competition case, namely equations (3.4) and (3.5).

$$\text{Demand Equation}: \quad L^* = \left(\frac{\psi A^{\psi}}{1+r}\right)^{\frac{1}{1-\psi}} \qquad \ldots(3.4)$$

$$\text{Supply Equation}: \quad \hat{r} = \frac{1+\rho-p(A)}{p(A)} - \frac{(1-p(A))C(A)}{p(A)L} \qquad \ldots(3.5)$$

Interest elasticity of loan demand for a given value of L, and r is calculated using the standard first derivative method as following

$$\varepsilon_r = \frac{\frac{\partial L^*}{\partial r}}{\frac{L^*}{r}} = \frac{-(\psi A^{\psi})^{\frac{1}{1-\psi}}\left(\frac{1}{1+r}\right)^{\frac{2-\psi}{1-\psi}}}{\frac{\left(\frac{\psi A^{\psi}}{1+r}\right)^{\frac{1}{1-\psi}}}{r}} = -\frac{r}{1+r} \qquad \ldots(3.4A)$$

Thus we obtain a simple expression for interest elasticity of loan demand and find that for any value of L and r, it depends directly on r only, and through r it depends on L* also. Further, the absolute value of the elasticity is always less than 1, hence equation (3.4A) suggests that demand for loan is price inelastic. This result is in close conformity with the empirical findings of Dehejia et al (2007). Also we obtain following comparative statics

$\frac{\partial \varepsilon_r}{\partial r} < 0$; for example: $\varepsilon_r = 0$ at $r = 0$; $\varepsilon_r = -.5$ at $r = 1.0$; and $\varepsilon_r = -1$ at $r = \infty$

Hence, the absolute value of price elasticity is an increasing function of r. In the neighborhood of very low interest rates it is nearly zero, hence the loan demand is quite price inelastic for very low interest rates. The price responsiveness increases with increasing interest rates, but it always remains below unity. This implies that when interest rates are already very low, further reduction of interest rate will not help in increasing the demand much. However, when interest rates are high, further reduction in interest rates will help in increasing the loan demand but for all values of the interest rate the price responsiveness will be less than unitary.

Further using loan supply equation (3.5), we can investigate the relationship of asset endowments and interest elasticity of loan demand as following:

$$\hat{r} = \frac{1+\rho-p(A)}{p(A)} - \frac{(1-p(A))C(A)}{p(A)L} \quad \text{...(3.5). In the first best case, collateral, C(A)} = 0.$$

Replacing the value of r in equation (3.4A), following expression of elasticity is obtained

$$\varepsilon_r = -\frac{1+\rho-p(A)}{1+\rho} = -\{1-\frac{p(A)}{1+\rho}\} \quad ; p'(A) > 0 \qquad \text{...(3.4B)}$$

As probability of success is increasing in A, hence $\frac{\partial|\varepsilon_r|}{\partial A} < 0$

Equation (3.4B) suggests that the households having lower assets are more price responsive. Hence the poorer families will increase the loan demand comparatively more if interest rate is reduced by same amount for all the families. This result is also in conformity with the empirical findings of Dehejia et al (2007).

These findings are summarized in Result 3.8.

Result 3.8: The interest rate elasticity of loan demand is found to be less than 1. Hence the loan demand is price inelastic. The absolute value of price responsiveness increases with interest rate. Also it decreases with increasing value of family assets.

3.4.5 Policy Intervention[10]

It has been demonstrated that information asymmetry in credit market generates Pareto inefficient contracts. A Pareto improving market intervention can be made only when the market equilibrium allocation fails to be a constrained Pareto optimum (an allocation that cannot be Pareto improved by an authority who is equally unable to observe agents' private information). Some of the equilibria (separating and good borrower gets at least L*) discussed in adverse selection set up are essentially constrained Pareto optima. Furthermore, even if it is impossible to Pareto improve a constrained Pareto optimal allocation; market intervention could still be justified to attain specific distributional goals; for example the welfare of various types of borrowers are weighted differently then aggregate surplus can be raised from the equilibrium level although some of the borrowers are made worse off in the process. The welfare analysis conducted in section 4.3 and analysis of price elasticity of loan demand conducted in section 4.4 suggests following policy interventions that may improve aggregate welfare:

1. The policies which may reduce information asymmetry. The microfinance credit programs (Morduch, 1999) essentially works on this principle that uses joint liability lending mechanism to mitigate the problems of information asymmetry.
2. The policies which increase the success probability (q) of the bad borrower (having lower assets, here) and reduce interest rate r, are welfare enhancing. This essentially works on the principle that Pareto improving market interventions need to loosen the constraints imposed by adverse selection or moral hazard problem. These constraints essentially help the borrowers to self-select the contracts most suitable to their type. Basically the bad borrowers want to mimic the good borrowers. Hence the policies that help in loosening the incentive compatibility

[10] Discussion benefits from Mas-Colell et al (1995)– Chapters 10, 13, and 23, and Gale (1989).

constraints of bad borrowers increase aggregate welfare. Increasing the probability of success q will reduce interest for the borrower. This will further reduce collateral requirements for the good borrower (following from incentive compatibility constraint) and this increases efficiency. Loan guarantees (full or partial) for bad borrowers effectively increase her probability of success q and hence will reduce interest for her.

3. The Result 3.8 suggests that loan demand is price inelastic. However, it is comparatively more price responsive for the families having lower assets also the absolute value of price responsiveness increases with interest rate. Hence the bad borrowers, who have lower assets and face higher interest rates, may benefit more if interest rate is reduced for them. The loan demand and take-up may increase comparatively more by these families following interest rate reduction. Loan guarantees or subsidy may help in reducing interest rates faced by these families.

3.5. Empirical Analysis

The analytical framework developed in the earlier sections highlights the prevalence of information asymmetry in credit market as a major factor contributing to credit rationing. As explained earlier the information asymmetry arises because the borrower has private knowledge about his risk type (Asset endowment in this chapter) and the contracts (combination of interest, collaterals and loan size) may induce strategic default. Consequently we see that credit rationing can be explained by a metric of asset endowments, interest rates, collaterals etc. In this section empirical strategies are developed; (i) to measure the propensity of credit rationing at household level and to estimate the nature of associations of important factors which explain that, and (ii) to test for presence of information asymmetry in the credit market.

The demand and supply equations of loans developed in first best case will be used as the underlying model for econometric estimation. In first best case these are represented by equations 3.4 and 3.5, which are repeated here as following:

Demand Equation $3.4 \Rightarrow L^* = (\frac{\psi A^{\psi}}{1+r})^{\frac{1}{1-\psi}}$; Taking log both sides, we get

$$\ln(\mathrm{L}^*) = \frac{1}{1-\psi}\ln(\psi) + \frac{\psi}{1-\psi}\ln(\mathrm{A}) - \frac{1}{1-\psi}\ln(1+r)$$

and Supply Equation 3.5 $\Rightarrow \hat{r} = \frac{1+\rho-p(A)}{p(A)} - \frac{(1-p(A))C(A)}{p(A)L}$

In the demand equation, interest rate r comes from supply equation (lender's decision), which is a function of assets (A), collateral posted (C) and loan size (L). The supply equation is non linear in collateral and loan size. So there is a problem of simultaneity here. Ideally these equations should be estimated as a system of equations using full information maximum likelihood (FIML) method. But that seems intractable. Alternatively demand equation can be estimated if an instrumental variable of interest rate is used. In absence of a good instrument for interest rate, it also seems difficult.

To make the estimations tractable, the interest rate in demand equation is approximately replaced from the supply equation – noting the fact that interest rate is monotonically decreasing with the amount of collateral and varies in some nonlinear manner with asset size. But in the demand equation asset is already controlled for and the non-linearities can be approximately tackled by taking its powers or interactions with other covariates. So simply a collateral term is added in the demand equation – doing so, some efficiency is sacrificed, but that's the best we can do here.

Essentially the estimation model for demand of loan is obtained as

$$\ln(\mathrm{L}) = \alpha + \frac{\psi}{1-\psi}\ln(\mathrm{A}) + \beta\mathrm{X} + \lambda\mathrm{C} + \varepsilon \qquad \ldots(3.35)$$

Where, X is a set of control variables, and ε is error term that helps in explaining the deviations from the first best case.

The credit rationing equation (essentially supply equation: in the sense of supply of loan < demand of loan) is estimated using following estimation model

$$\text{Credit Rationed} = \mu + \eta(1/\text{A}) + \delta\text{X} + \phi\text{C} + \nu \quad \text{...(3.36)}$$

Here inverse of assets A is used, as A appears that way in the interest rate equation. It also ensures that a positive value of credit rationing is obtained, as every one is assumed to be credit rationed to some extent (between 0 and 1). X is a set of control variables, and ν is error term.

Next part of this section discusses identification strategy to consistently estimate above equations.

3.5 A. Econometric Model of Credit Rationing

The estimable demand and supply equations (3.35) and (3.36) will be used to estimate the extent of credit rationing in the rural areas of India and China using the household survey data mentioned earlier. Based upon responses on a specific set of survey questions, a household belonging to any of the following categories has been assigned as credit rationed – (i) whose loan application is rejected, (ii) who could not get adequate credit for various purposes (consumption, education, health, farming or business), and (iii) who never obtained desired amount of credit.

This measure of credit rationing suffers from serious limitations, such as – (i) It does not measure the propensity of credit constrainedness of a person. Realistically every person depending upon her socio- economic conditions may be credit rationed to some extent. In a scale of zero to one; zero means not credit rationed at all and one means fully credit rationed and any value in between implies partially credit rationed. (ii)

Then in the data the first two categories of credit rationed families are explicitly identified. The third category, the desired amount of credit of a family is not observed. To overcome these two limitations econometric methods as discussed next are used to appropriately measure the extent of credit rationing and to understand the nature of associations of important observable covariates that explain credit rationing. The summary description of formal credit market related outcomes for the households are reported in Table 3.5.

Table 3.5: Description of Borrowing Behavior and Credit Constraint

Variable (binary variables) : Values reported in percentage	China		India	
	Mean	Observations	Mean	Observations
Loan application rejected (a)	.31	1010	.41	399
Could not get adequate loan for various purposes (b)	.30	756	.45	384
Never get desired amount of loan (c)	.38	1320	.62	400
Sometimes got desired amount of loan	.30	1320	.30	400
Always got desired amount of loan	.32	1320	.07	400
Credit Rationed =1; if either of a,b,c=1	.58	1418	.66	400

3.5. A.1. Identification Strategy

Our main objective is to consistently estimate equations 3.35 and 3.36 for whole sample. But the credit market outcomes modeled by these equations are estimated only for a subset of population for whom the outcomes have been observed. The Demand for credit is a latent variable and we observe only positive demand for a part of the population. So also supply decision of lender is a latent variable and only positive loan supply is observed for a part of this population. Similarly desired amount of credit for this part of population is a latent variable and we observe only the actual amount of credit the borrower gets. Thus there are sample selections in observations at two stages – one at demand stage and another at supply stage. Hence if a model is estimated to understand the relationship (causal or plain association) of explanatory variables with

the amount of credit obtained then the estimated coefficients suffer from selection bias, which need to be corrected. The correction is achieved using Heckman sample selection correction methodology, explained in Appendix 3.2.

Essentially we proceed as follows. In first stage equations B1 and B2 (binary variants of equations 3.35 and 3.36 respectively) are estimated using probit regression method. In equation B1 the dependent variable B_d indicates whether the borrower has positive demand of formal loan. The families who are either successful in obtaining loan or who are denied loan are considered to have positive demand for loan, B_d =1 for them and zero for others. Apparently these two categories of families are characteristically different along some of the variables as shown in Table 3.6.

Table 3.6: Summary statistics of important variables for the two types of households

	India : N=400		China: N= 1418	
Variable	Mean(success)	Mean (denied)	Mean(success)	Mean (denied)
Household size	6.94	6.04 (*)	4.62	4.50 (*)
Education (1-4)	2.74	2.51 (*)	2.43	2.35
Asset per capita (currency)	71175.61	60930.76 (*)	15148.47	13326.36 (*)
High saving (%)	.04	.02 (*)	.10	.16 (*)
Informal loan (%)	12.34	29.20 (*)	24.29	38.29 (*)

N.B. * Indicates the difference is statistically significant at 5% level.

In equation B2 the dependent variable B_s indicates whether the borrower gets the desired amount of loan. It is an indirect measure of whether the borrower is not credit rationed. Hence for the families who are not found to be credit rationed, B_s=1 and zero otherwise. Also the inverse mills ratios M_d and M_s are computed for each observation from above estimations. Then OLS model related to demand for loan (equation 3.35) is estimated using equation B7 in which the M_d and M_s are included to control for selection problem. These equations are shown as following.

$$B_d = 1(\beta_d \mathrm{X_d} + \varepsilon_\mathrm{d} > 0) \quad : \varepsilon_\mathrm{d} \approx N(0, \sigma_d^2) \qquad \text{...(B1)} : \text{binary variant of equation (3.35)}$$

$$B_s = 1(\beta_s \mathrm{X_s} + \rho_d \sigma_\mathrm{s} \mathrm{M_d} + \varepsilon_\mathrm{s} > 0) \; : \varepsilon_\mathrm{s} \approx N(0, \sigma_s^2) \; \text{..(B2)} : \text{binary variant of equation (3.36)}$$

$$\mathrm{D} = \gamma \mathrm{X} + \rho_\mathrm{d} \sigma M_\mathrm{d} + \rho_\mathrm{s} \sigma \mathrm{M_s} + \varepsilon \qquad \text{...(B7)}: \qquad \text{Equation (3.35)}$$

3.5. A.3. Estimations of the Models

For consistent estimation of the coefficients, it is necessary that E(X'ε) = 0. This assumption gets substantially violated when – (i) any of the explanatory variables is affected by the explained variable because of simultaneity; and (ii) any of the explanatory variables is not strictly exogenous and is determined by other observable and unobservable variables, which may be correlated with the error term. Basically the explanatory variables should be exogenous and not correlated with the error term.

This requirement has been duly followed here when choosing explanatory variables for estimations of equations B1 and B2. The relevant explanatory variables used are sex, age, education, asset per capita, income source (farming major source=1), high saving category (saving > 10%), not prefer to be indebted to bank or RCC, and various types of apprehensions in obtaining loan such as unpaid debts, high interest rates, delay and bribe. Also regional dummies are used, 3 dummies in the case of India and 1 in the case of China. As we have no data on amount of collateral posted, it is proxied by the belief of borrower related to his ability to post collateral ("lack collateral") and whether the borrower has been denied loan because of collateral ("denied collateral").

The summary statistics of important household variables are presented in Table 3.7, and the summary statistics of other explanatory variables are reported in Table 3.8. These variables are used to control for some of the beliefs of the borrowers, which may affect his propensity of demand for loan from formal sources.

Table 3.7: Summary statistics of important Household Variables

	China			India		
Variable	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Farm Size(mu /acre)	1556	5.47	3.99	400	2.98	2.40
Household income[a]	1555	11462.7	12176.89	400	45577.25	37631.05
Asset Value[a]	1419	52286.8	54910.84	400	408352.5	600320.7
Income source (1=farm)	1419	.42	.49	400	.77	.41
Education (1-4)[b]	754	2.40	.78	400	2.54	.82
Sex (1=female)	756	.10	.30	400	.003	(.05)
Age (Years)	754	40-50	10	400	47.5	11.5
Household Size	1155	4.4	1.55	400	6.6	3.5
amount of debt[a]	1020	13336.8	26585.34	337	15671.96	21400.19

a. Units are local currency (RMB in China / Rupees in India). b. Education: 1- No schooling, 2 – Primary schooling, 3- Secondary schooling, 4 – College and above.

Table 3.8: Summary Statistic of Other Explanatory Variables (Beliefs of Borrower)

Variable: Binary variables (1=yes, 0=no)	Mean (s.d.) : China (N=756)	Mean (s.d.) : India (N=384)
Lacks collateral	.53 (.50)	.47 (.50)
Denied loan because of collateral	.64 (.47) N=525	.50 (50) : N=175
Apprehensions because of unpaid debts*	.51 (.50)	.46 (.50)
Apprehensions because of high interest rates*	.68 (.46)	.34 (.47)
Apprehensions because of delay and bribe*	.45 (.50)	.93 (.24)
Do not like to be indebted to a bank or RCC	.67 (.47)	.44 (.50)
High saving (>10% =1)	.19 (.40)	.04 (.19)

Note for *: Apprehensions means, apprehensions in obtaining formal loans

Before explaining the estimation results, using equations 3.35 and 3.36 we can make key conjectures on natures of associations of variables, mentioned as following.

1. Loan demand is likely to increase with age in the beginning as credit needs are high in the beginning of life cycle but later it decreases, hence square of age is used to control for that. Loan supply may also follow similar pattern.
2. Loan demand is likely to increase with assets level, but as explained earlier both linear and quadratic terms are introduced.
3. The loan supply is likely to increase with assets level.

4. Loan demand is likely to increase with ability to post larger amount of collateral. Loan supply is also likely to increase with this.
5. Loan Demand is likely to increase with education level, as education and asset are found to be positively correlated. Loan supply is also likely to show similar behavior.
6. Loan demand is likely to be negatively affected by various types of apprehensions as mentioned above. There are no a priori conjectures on supply part.

These conjectures are also hypothesized to hold for Propensity of demand for loan. Now the probit estimation results of equation B1 (propensity of demand for formal loan) are reported in Table 3.9.

Table 3.9: Propensity of Demand of Formal Loan* = $X\beta + \varepsilon d$ (probit)

Positive Demand for loan (1=yes, 0=no)	India (384)		China (660)	
(obtained and denied =1)	Coef.	Z	Coef.	Z
Sex (Female=1)			-0.285	-1.68
Age	.068	1.44	-0.135	-0.39
Age square	-.0006	-1.43	0.026	0.41
Household size	-.051*	-1.86	-0.094*	-1.72
Education	.230*	1.98	-0.011	-0.16
Income Source (Farm=1)	.491*	2.24	-0.026	-0.24
Asset per capita	-.161*	-1.84	-0.610*	-1.99
Asset per capita sq	.004	1.57	0.088*	2.07
Lacks collateral (1=yes)	-.47*	-2.25	-0.077	-0.69
Denied loan for collateral (1=yes)	2.10*	5.83	1.077*	7.08
Apprehensions because of unpaid debts (1=yes)	1.14*	5.69	0.196*	1.82
Apprehensions of high interest rates (1=yes)	-.35	-1.58	-0.113	-0.94
Apprehensions of delay and bribe (1=yes)	.794*	1.93	0.278*	2.53
Do not like to be indebted to a bank or RCC (1=yes)	-.20	-1.02	-0.27*	-2.3
High saving (1: saving>10%)	.510	1.20	-0.482*	-3.46
Asset quintile group (1 to 5 in increasing order)	.30*	1.96	0.251*	2.3
region6	.392	1.36	0.220*	1.85
region8	0.89*	2.54		
region9	.474*	1.81		

India: LR χ^2 (19) =195.38; Prob > χ^2 = 0.00; N=384; Psudo R2 = 0.40
China: LR χ^2 (17) = 119.71 ; Prob > χ^2 = 0.00 ; Pseudo R2 = 0.14

Both probit regressions are significant (high χ^2 statistic). Also many variables are individually significant. We are interested in the nature of associations rather than marginal effects of variables. From this regression following inferences are drawn:

1. Age is found to be insignificant in the case of both China and India, but bears conjectured sign in the case of India.
2. Education is found to be significant and positively associated with propensity of demand for India but not found to be significant for China.
3. Household size is negatively associated in the case of both countries. It means that with increasing family size the likelihood of demand for formal loan decreases.
4. In the case of India, apparently families depend more on credit for farming as this variable is found positively associated.
5. The likelihood of demand for loan in both the countries seems to vary quadratically with asset size. For low values of assets it is low and because of positive quadratic factor it increases in a convex manner with asset size. It is as per the conjecture.
6. In the case of India, likelihood of demand for loan is negatively associated with the belief of lack of ability to post collateral – which is as per the conjecture. Also in the case of both the countries the propensity of demand for loan is positively associated with the belief of denial a loan because of lack of collateral variable. This positive coefficient appears to be driven by the denied group of families, for whom propensity of loan demand is also 1. These findings highlight the role of collateral in non price credit rationing.
7. In the case of both the countries the likelihood of demand of loan is negatively (not significant) associated with borrower's apprehension of high interest rate. This finding gives evidence on downward sloping loan demand curve. Also in the case of both the countries it is negatively associated with the preference of borrower not

to be indebted to banks or RCC. But other two apprehensions (apprehensions of unpaid debts and apprehensions of delay and bribe) are found to be positively associated with propensity of demand for loan. The denied group of families apparently drives these two counterintuitive results.

8. In the case of China, higher saving is negatively associated with the propensity of demand of a loan. Apparently families have less propensities to demand a loan, who save more. But in the case of India the relation goes otherwise.

In the case of some of the variables the associations are found to go other way. It may be happening because the dependent variable includes two types of families – one who got the loan and others who are denied. As shown earlier these two categories of families characteristically differ along some of the variables.

Thereafter the inverse mills ratio (M1) is computed for the observations of both the countries and summary statistics are summarized in Table 3.10. This variable is used in the estimation of equation (B2) i.e propensity of not being credit rationed. Loan supply is observed only for the families for whom binary loan demand variable is 1, others are artificially bunched at zero. The inverse mills ratio obtained from demand equation is used in the supply equation to control for this selection bias.

Table 3.10: Summary statistics of Predicted values of Inverse Mills Ratio (IMR, M1)

Country	Variable	N	Mean	Std. Dev.	Min	Max
India	Inverse mills1	384	.600	.612	0	2.63
China	Inverse mills1	660	.714	.32	.004	1.71

Thereafter equation B2 is estimated using probit regression method. The dependent variable is, whether the borrower gets desired amount of loan, i.e. not credit rationed. The results are reported in Table 3.11. As suggested by equation 3.36, inverse of assets endowment is used as an important explanatory variable. Here collateral is proxied by combination of both proxies ("lack collateral" and "denied collateral") and

denoted as "Collateral deficiency", as we are no more interested in separately controlling for denied families.

Table 3.11: Probit: Not Credit rationed (Supply ≥ Demand) $= X\delta + \varepsilon s$

Not credit rationed (1=yes)	India		China	
	Coef.	z	Coef.	Z
Sex (Female=1)			-0.158	-0.9
Age	0.037	0.88	0.422	1.24
Age square	0.000	-0.46	-0.075	-1.23
Household size	0.035	1.37	0.034	0.91
Education	0.472*	4.13	0.007	0.11
Inverse (asset per capita)	-6.730*	-1.98	-0.118	-0.34
Collateral deficiency (1=yes)	-0.990*	-2.57	-0.875*	-3.56
Likely to borrow more if interest rates are low	0.400*	1.99	-0.216*	-1.81
Apprehensions because of delay and bribe	-0.483*	-1.55	0.006	0.06
Do not like to be indebted to a bank or RCC	-0.842*	-4.78	0.042	0.34
No saving	-0.417*	-2.21	0.043	0.38
Inverse mills ratio 1 (IMR 1)	0.797*	3.48	1.067*	3.79
Region6	0.483	1.72	-0.097	-0.8
Region8	-0.414	-1.38		
Region9	0.288	1.1		

India: N= 384 ; LR χ^2 (16) = 159.71 ; Prob > χ^2 = 0.00 ; Pseudo R2 = 0.27
China: N = 660; LR χ^2 (15) = 128.68; Prob > χ^2 = 0.00; Pseudo R2 = 0.12

Both probit regressions are quite significant (high χ^2 statistic). Also many variables are individually significant. Again we are more interested in the nature of associations rather than marginal effects of variables. It is observed that in the case of India most of the variables bear sign as per conjecture and are also significant. However, the age variable is not found significant. Also the borrowers' preference for not getting indebted to banks or RCC is found negatively associated with likelihood of not credit rationed – whereas it is conjectured to be positively associated. Similar natures of associations are observed in the case of China with a few exceptions. One major exception is non-significance of inverse of asset size but it bears the desired sign. The education variable is also not found significant here. Furthermore significantly positive coefficient of interest reduction variable in the case of India suggests

negatively sloping loan demand curve. In the case of China, the negative coefficient of this may be driven by loan supply (which may be regulated by RCC) not matching with demand, hence increasing the propensity of credit rationing.

Also selection bias is significantly observed in the case of both countries, as inverse mills ratio of first selection equation is significant. Exclusion of this variable would have made the estimations of the coefficients biased. The positive coefficient suggests that less credit rationing is observed once we control for the selection bias in the sample. The inverse mills ratio (M 2) is computed and is summarized in Table 3.12.

Table 3.12: Summary statistics of Predicted values of Inverse Mills Ratio (IMR, M2)

Country	Variable	N	Mean	Std. Dev.	Min	Max
India	Inverse mills2	384	1.42	1.00	.11	4.30
China	Inverse mills2	660	1.002	.49	.35	2.63

Also the predicted values of probability of being credit rationed are computed and its' probability density graph for China is shown in figure 3.10. Similar plot is obtained for India. Approximately these are normally distributed - note that we started with a binary measurement for credit rationing.

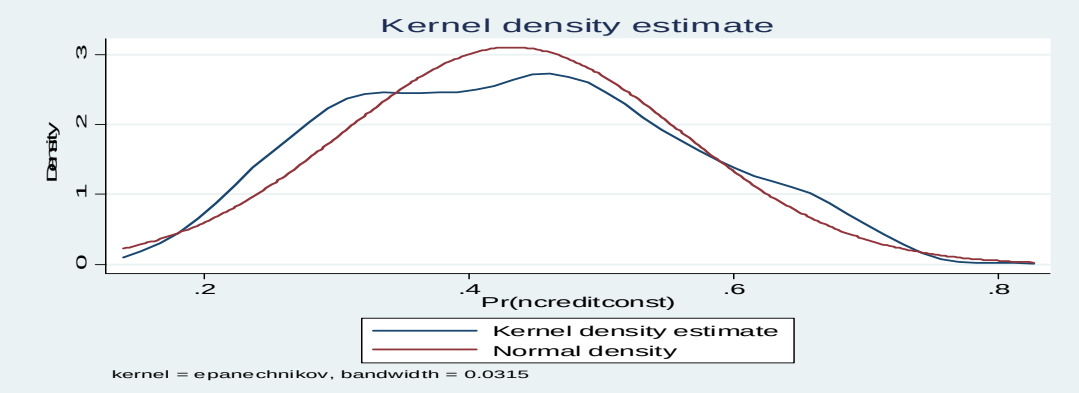

Figure 3.10: Probability Density of Predicted Values of Credit Rationed (China)

After estimating the two selection equations (related with propensity of demand and supply of desired amount of credit) the unconstrained debt equation (B7, or 3.35) is estimated. The estimable equation B7 essentially follows from equation 3.35. The dependent variable is log of loan amount of a family. Important explanatory variables are assets size and proxy for collateral. Also inverse mills ratio M1 and M2 are used as control variables to take care for selection problems. Equation 3.35 suggests that the coefficient on the log of assets size gives a measure of productivity (ψ=coeff/(1+coeff)) of assets and loan amount. The results for both the countries are reported in table 3.13.

Table 3.13: OLS: log (debt) = Xγ +b1 IMR1 + b2 IMR2 + ε

Log (debt)	India		China	
	Coef.	T	Coef.	T
Sex			-0.330	-1.63
Age	0.008	1.44	-0.024	-0.4
Household Size	0.096*	4.36	0.140*	3.37
Education	0.098*	2.13	-0.017	-0.46
Major Sickness (1=yes)	0.232	1.83	0.167	1.32
Log asset per capita	0.294*	3.47	0.521*	7.33
Collateral deficiency(1=yes)	-0.111	-0.49	-0.039	-0.08
Apprehensions because of delay and bribe	-0.342	-1.19	-0.024	-0.21
Apprehensions because of high interest rate	-0.352*	-2.37	0.160	1.06
Inverse mills1	-0.823*	-6.17	-0.401	-0.88
Inverse mills 2	-0.112	-0.76	-0.201	-0.54
region6	0.149	0.71	0.100	0.76
region8	0.898*	4.27		
region9	0.746*	4.18		

India : N=312; F(15,299) = 24.70 ; Prob>F = 0.00; Adj. R-squared=0.52
China : N= 368; F(12, 352) = 7.68; Prob > F = 0.00; Adj R-squared = 0.16

Both OLS regressions are quite significant (high F statistic, in the case of China it is satisfactory). Also most variables are individually significant. Again we are more interested in the nature of associations rather than marginal effects of variables. It is observed that in the case of both the countries most of the variables bear sign as per conjecture and are also significant. Household size, education, and asset endowments are positively associated with desired amount of credit. There are some exceptions

however. In the case of China the education variable is not significant. The "Collateral deficiency" variable bears appropriate sign but not significant in the case of both countries. One explanation for this is – collateral is more likely to influence the propensity of the formal loan demand (supported by the results of Table 3.10), but once a borrower decides to obtain a formal loan, then this may not be important, and loan amount is driven more by assets than collateral. Another explanation for this is that, this proxy variable for collateral may not be a very precise measure of collateral posting ability, and the household asset can also indicate the collateral posting ability. Again in the case of India significantly negative coefficient on the interest rate variable gives credence to negative sloping loan demand curve. In the case of China we do not get such result. Again this may be driven by regulated supply of loan by RCC, which needs further investigations. Furthermore two important findings are:

1. The proposed model appears to show selection bias in the case of both the countries as inverse mills ratio of first selection equation is significant at 5% level in supply equation and further in the case of India it is also significant in the demand equation (B7).

2. The estimated values of productivity coefficient ψ are .22 and .30 for India and China respectively - that seems realistic.

Then using equation B7 the predicted values of desired amount of debt for families are computed and the results are reported in table 3.14. Evidently the mean values of desired debt amount are higher than that of actual debt amount.

Table 3.14: Summary statistics of Predicted values of debt and actual value of debt

Country	Variable	Obs	Mean	Std. Dev.	Min	Max
India	Actual Debt Amount	336	15659.08	21430.8	0	200000
India	Predicted debt Amount	380	17746.42	17982.72	750.54	2333691.2
China	Actual Debt Amount	407	19597.05	31447.37	300	480000
China	Predicted debt Amount	651	20324.34	10502.57	2225.6	116984.48

Further the predicted values of likelihood of credit rationed for each family is computed using equations B2 and B7. The predicted values of credit rationed following from equation B2 are approximately normally distributed between 0 and 1. It indicates the likelihood of getting credit rationed of a family. But the predicted values from equation B7 are again a binary number (0 or 1). It indicates whether desired amount of credit is larger than actual amount of credit. The comparative mean values of credit rationing across the five quintiles of assets are reported in Table 3.15.

Table 3.15: Summary statistics of Credit constraints of Households

Quintile Assets:**India**	Value of Credit constraint (binary)	Predicted value of credit constraint (based on equation B2) (continuous)	Predicted value of credit constraint (based on equation B7) (Binary)	N
1	0.703	0.720	0.66	96
2	0.733	0.698	0.73	59
3	0.646	0.655	0.73	76
4	0.670	0.678	0.74	84
5	0.451	0.490	0.67	69
Total	0.65	0.651	0.70 (N=325)	384
		China		
1	0.570	0.608	0.72	146
2	0.500	0.573	0.67	78
3	0.593	0.572	0.68	147
4	0.612	0.550	0.57	134
5	0.483	0.527	0.73	146
Total	0.555	0.567	0.68 (N=364)	651

Evidently the first two measures seem to be decreasing with higher value of asset quintiles – implying that families having more assets are likely to be less credit rationed. However it is other way for the last measure of credit rationing. The last measure also exceeds uniformly other two measure across all quintiles – implying that

magnitude of credit rationing is understated for families in all assets quintiles and more so in higher assets quintiles, when the estimated value of desired loan amount is taken into account.

Important findings from this empirical investigation are mentioned as following:

1. A large percentage of rural families in India and China are credit rationed in the formal credit market. Both type I and type II credit rationing is observed.

2. Important determinants of credit rationing are – household assets, household size, ability to post collateral, education level, and various types of apprehensions in obtaining formal loan such as, high interest rate of formal loan, delay and bribe, unpaid debts etc.

3. The sign and significance of coefficients of explanatory variables largely matches with the predictions of analytical results of section 3.

4. Significance of collateral and various apprehensions to obtain formal loan, suggest prevalence of information asymmetry in the credit market.

Next part of this section develops a test to examine the prevalence of information asymmetry in the credit market.

3.5. B. Test of Information Asymmetry

The results derived in section 3 make following predictions:

1. Result 3.1 says that in perfect information case, no collateral is required and there is no credit rationing in equilibrium.
2. When the lenders do not know the types of borrowers then the problem of adverse selection arises. Here there are two possibilities on types of contracts offered in equilibrium. Result 3.2 says that when no collateral is used, then pooling equilibrium contracts are offered in which the good borrower cross subsidizes the bad borrower. The good borrower may be type I and type II credit rationed.

3. In the other scenario, Result 3.3 says that if wealth constraints are not binding on collateral then separating equilibrium contracts are offered. The bad borrower gets first best contract, whereas the good borrower posts collateral in lieu of reduced interest rate and her loan size may be smaller than that of first best. However if wealth constraint is binding then perfect separating equilibrium may not be obtained and pooling equilibria with type II and type I rationing may be obtained.
4. Result 3.5 says that lender may restrict loan size to resolve strategic default problem. Further result 3.6 says that likelihood of strategic default increases with repayment obligations i.e. loan size and interest rate.

Some important observations are made from survey data that gives at least naïve evidence on prevalence of information asymmetry in credit market of these economies.

1. Almost 68 percent families (of survey sample) in the case of India and 58 percent families in the case of China are found to be credit rationed. Also more than 50 percent families cited inability to post collateral as major reason for not getting formal loans. These findings suggest that perfect information is not a good assumption for formal credit market in these economies.
2. Further about 60 percent respondents in both the countries stated that honest borrowers are compelled to pay higher interest rate, because some borrowers do not repay loans. Also about 70 percent and 35 percent respondents respectively in India and China cited the unaffordable interest rate for feeling apprehensive in obtaining formal loans. These findings suggest on cross subsidizing of bad borrowers because of adverse selection credit market. But as collaterals are still needed to obtain loans, which corroborates against pooling equilibrium.
3. Further as discussed in point 1, apparently wealth constraint is binding on collateral posting for a large number of families – hence perfect separating

equilibrium is not attainable in these economies. Some collateral constrained families may not be able to get loan at all and are thus type II rationed or they are able to get loan less than the desired amount and hence type I rationed. This is also corroborated by the data – as about 65 percent families in India and 38 percent families in China said that they never got required amount of loan.

4. Also the data reveals that there is considerable delay in repayment of such formal loans. About 40 percent families in India and about 20 percent families in China delayed in repayment of loans at least once. Also about 20 percent families in India and about 5 percent families in China have defaulted on loan repayments. Further more than 70 percent families in China and India believe that the borrowers who get loan at higher interest rate or disproportionate to their asset are more likely to voluntarily default on repayment obligations. These findings suggest the prevalence of strategic default (moral hazard) problem in credit market of these economies.
5. It is also revealed that families having higher assets are more likely to get required amount of loan. In the case of India only 6 percent families belonging to lowest quintiles of assets received the required amount of loan in comparison to 15 percent families belonging to highest quintile. In the case of China these percentages are 20 and 45 respectively. Restriction of loan size below L* (first best case) by the lender to resolve strategic default problems, may be one of the possible explanations for this.

The findings suggest that these credit markets suffer from information asymmetry problem. But it is empirically difficult to isolate the adverse selection and moral hazard effects. A host of data and econometric problems are discussed as following:

1. Information on amount of collateral posted to obtain a loan is not available. In fact it is quite difficult to elicit this information from the respondents.

2. In the case of China few observations are available on interest rates charged by banks and RCC. Further, in both the countries the formal lending interest rates are usually regulated, so not much variation is observed in the interest rate. As revealed from the data the coefficient of variation of formal interest rate is just 0.2 in the case of India and it is about 0.9 in the case of China.
3. The respondents usually underreport the default rate. Moreover it is difficult to elicit the information whether the default is strategic or not.
4. In cross section data we cannot control for unobserved individual heterogeneities. The distinction between adverse selection and moral hazard primarily depends on the interpretation on observed behaviors of borrowers. One interpretation is that unobserved heterogeneity across the borrowers is responsible for different contract choices and so the selection of contracts is endogenous. This is adverse selection interpretation. Another interpretation is that the contracts induce the observed behaviors through their underlying incentive structure – this is moral hazard interpretation (Salanie, 2005).
5. Ideally randomized experiments should be conducted to isolate the selection and incentive problems such that the allocation of the contracts to different borrowers is exogenous – that takes care of selection problem. However such experiments are quite time consuming and costly. One such example is Rand Health Insurance Experiment (Manning et al 1987).
6. Another strategy is to use panel data. One advantage is that unobserved heterogeneities can be controlled. Other advantage is that dynamics of contracts can be studied. It could provide tests in which adverse selection and moral hazard generate opposite predictions (Chiappori and Heckman, 1999) and hence it is possible to test for adverse selection and moral hazard.

One way to test the adverse selection, is to estimate the following model

$$r = \beta_t T + \beta_x X + \beta_l L + \varepsilon_r$$
$$C = \gamma_t T + \gamma_x X + \gamma_l L + \varepsilon_c \quad ...(3.37)$$

Where, T = Risk types of borrower (suppose for good and bad, T = 1,0), X = important control varaibles (such as income, asset , age etc.) , L = amount of loan; r = interest rate of the contract; C = collateral posted for the contract. The evidence of adverse

selection (separating equilibrium) will come when the Null hypothesis
H0 : $\beta_t = 0$ and $\gamma_t = 0$ is rejected in favor of Alternative hypothesis
Ha : $\beta_t < 0$ and $\gamma_t > 0$

Once we account for adverse selection effect, we can test for moral hazard using the following model:

$$D = \beta_x X + \beta_r r + \beta_c C + \beta_{ex} L_{ex} + \varepsilon_d \quad ...(3.38)$$

Where , D = default rate; X = important control variables; r = interest rate of contract
C = collateral posted; L_{ex} = Excess (more than repayment capacity) loan taken .

The evidence of moral hazard will come when the Null hypothesis
H0 : $\beta_r = 0$ and $\beta_c = 0$ and $\beta_{ex} = 0$ is rejected in favor of alternative hypothesis
Ha : $\beta_r > 0$ and $\beta_c < 0$ and $\beta_{ex} > 0$

But observations are not available on many of these variables; also it is difficult to get data on those variables. Hence this estimation method is not implementable here.

However Chiappori and Salanie (2000) have developed a positive correlation test for asymmetric information in insurance market. In simple form it involves estimation of two equations which describes two different decisions of agents – one for choice of insurance coverage and another for claim of compensations. Under null hypothesis of no information asymmetry the residuals of the two equations should be uncorrelated. However in presence of adverse selection and moral hazard it can be predicted that those with more insurance are more likely to experience insured risk and so claim for more compensations and consequently the errors of these two equations will be positively correlated. Hence if errors are found to be significantly positively correlated

then the null hypothesis of no information asymmetry is rejected. However this test does not distinguish between adverse selection and moral hazard.

3.5. B.1. Positive Correlation Test for Information Asymmetry in Credit Market

Using the above framework, two probit models are estimated. One is for the success in obtaining a formal loan and another for the defaulting on the formal loan.

$$y_1 = 1(y_1^* = x_1\beta_1 + u_1 > 0)$$

$$y_2 = 1(y_2^* = x_2\beta_2 + u_2 > 0)$$

$$\begin{pmatrix} u_1 \\ u_2 \end{pmatrix} \approx N\left\{\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix}\right\} \qquad \text{...(3.39)}$$

Here y_1* and y_2* are latent variables – propensity of approval of loan and propensity of default conditional on approval of loan. The observed variables are y_1 and y_2 respectively. These variables are observed as 1 if respective latent variables are positive and zero otherwise. In presence of adverse selection and moral hazard, the two decisions of borrowers; one to successfully obtain a loan (here the decision of lender is also implied), and conditional on this later to default on the loan, may not be independent. So rejection of null hypothesis of $\rho = 0$ suggests information asymmetry.

Also Chiappori and Salanie (2000) have suggested that these two equations are estimated independently. It entails some efficiency loss but the null can be tested easily with respect to a test statistic. Then the generalized residuals $\hat{u}_1$ and $\hat{u}_2$ are predicted. Then a test statistic is defined by

$$W = \frac{(\sum_{i=1}^{i=n} w_i \hat{u}_1 \hat{u}_2)^2}{\sum_{i=1}^{i=n} w_i^2 \hat{u}_1^2 \hat{u}_2^2} \qquad \text{...(3.40)}$$

Where w_i are weights - but we have used unweighted analysis.

Under the null of conditional independence, cov(u_1, u_2) =0, W is distributed asymptotically as $\chi^2(1)$.

The rejection of null provides a test for information asymmetry.

3.5. B.2. Results on Information Asymmetry based on India and China data

A summary statistics of demand of formal loan, delay and default on repayment of such loan are shown in Table 3.16.

Table 3.16: Summary Statistic of Demand of Formal Loan, Default and Delay in Repayment

Variables (binary)	Mean : India : N=384	Mean: China : N=1555
Demand of formal loam	.49	.25
Default formal Loan	.23	.025
Delay formal Loan	.51	.14
Default/ Delay formal loan	.51	.15

First the two probit regressions are estimated independently and the results are shown in Table 3.17 and Table 3.18.

Table 3.17: probit: Demand of Formal Loan* = $X\beta + \varepsilon d$

Dependent variable	*India (384)*		*China (660)*	
Propensity of Demand for loan (1=yes)	Coef.	Z	Coef.	Z
Sex (Female=1)			-0.220	-1.26
Age	0.124*	2.61	0.229	0.68
Age square	-.001*	-2.7	-0.048	-0.8
Household size	0.078*	2.51	0.061	1.74
Education	0.411*	3.19	0.048	0.69
Income Source (Farm=1)	0.589*	2.29	-0.218*	-2.02
Asset per capita	0.107*	2.62	0.201*	1.86
Asset per capita square	-.002*	-1.79	-.014	-0.6
Lacks collateral (1=yes)	-0.174	-0.75	-0.216*	-1.97
Apprehensions because of unpaid debts (1=yes)	1.673*	7.84	0.355*	3.35
Apprehensions because of high interest rates (1=yes)	-0.280	-1.12	-0.108	-0.91
Apprehensions because of delay and bribe(1=yes)	0.797*	2.02	0.250*	2.32
Do not like to be indebted to a bank or RCC(1=yes)	0.061	0.28	-0.170	-1.5
High saving (1=yes)	-0.137	-0.3	-0.646*	-4.36
region6	-0.046	-0.15	0.275*	2.4
region8	1.003*	3.05		
region9	-0.060	-0.2		

India: N=384; LR χ^2 (17) =288.38; Prob > χ^2 = 0.00; Pseudo R2 = 0.54
China: N= 660; LR χ^2 (17) = 77.27 ; Prob > χ^2 = 0.00 ; Pseudo R2 = 0.08

The regressors are satisfactorily exogenous and relevant to the decision model. Both the regressions are quite significant (high χ^2 statistic) except one – Probit regression for default for China data. A good number of variables are also individually significant, although we are mainly interested in the test statistic W.

Table 3.18: probit Regression for Default on Formal Loan

Dependent variable : Default on formal loan (1=yes)	India		China	
	Coef.	Z	Coef.	z
Sex (1=Female)			0.739*	2.61
Age	0.022	0.5	0.681	0.93
Age sq	0.0003	-0.75	-0.135	-1.02
Household size	0.064*	2.34	-0.051	-0.58
Education	-0.274*	-2.4	0.182	1.19
Income source	0.307	1.3	0.278	1.24
Logasset per persion	0.112	0.98	-0.065	-0.47
Lacks collateral	0.111	0.56	0.203	0.84
Apprehensions because of unpaid debts (1=yes)	1.142*	6.15	0.262	1.14
Apprehensions because of high interest rates (1=yes)	-0.406*	-1.82	-0.340	-1.38
Apprehensions because of delay and bribe(1=yes)	0.992*	2.5	0.439*	1.84
Do not like to be indebted to a bank or RCC(1=yes)	0.288	1.53	0.109	0.45
High saving (1=yes)	-0.448	-1.02	-0.580	-1.38
Loan from friend and relative (percentage)	-0.007*	-2.84	-0.001	-0.36
region6	-0.645*	-2.28	0.158	0.66
region8	-1.320*	-4.92		
region9	-0.685*	-2.58		

N = 384; LR chi2(16) = 101.08; Prob > chi2 = 0.0000; Pseudo R2 = 0.24
N = 659; LR chi2(15) = 22.55; Prob > chi2 = 0.0942; Pseudo R2 = 0.14

Using above probit regressions the W statistic is obtained for India and China and the values are shown in Table 3.19. The value is statistically significant in the case of India, but it is not significant in the case of China. Hence the rejection of null in the case of India provides evidence for information asymmetry in credit market. Also both probits are jointly estimated and the coefficients of correlation (ρ) of two error terms

are obtained and theses are shown in the same table. Again it is observed that null of conditional independence of two equations are rejected in the case of India, but not in the case of China.

Non rejection of null for China means that using this model and this data the evidence of information asymmetry is not obtained. Very low default rate recorded in the case of China may be one of the reasons for this. This conjecture is verified when in the second probit both delay or default in repayment of loan is used as dependent variable. Now the W statistic becomes significant and the null is rejected; also in the joint probit estimation significant value of ρ is obtained and the null of conditional independence is rejected.

Table 3.19: W statistic and ρ values obtained from Probit Regressions

Country (dependent variable in second probit)	Test Statistic , W	Biprobit (ρ)	s.e. (ρ)	Chi-square(1)
India (default)	30.39*	0.69*	.07	38.56
China (default)	2.46	0.20	.14	2.10
China (delay or default)	38.10*	0.42*	.06	38.86

The significance of these tests lie in presenting empirical evidence of prevalence of information asymmetry in credit markets in these economies although individual significance of adverse selection and moral hazard is not distinguished.

3.6. Conclusion

The main objective of this chapter is to assess credit-rationing problem in formal credit markets of rural areas of developing countries. Using the asymmetric information framework and assuming that probability of a project's success positively depends on endowment vectors of a borrower, both type I and type II credit rationing have been demonstrated. It has been shown that market equilibrium is attained by

usage of loan size, interest rate and collateral requirements as screening and incentive devices.

Further welfare implications of credit rationing has been analyzed and it has been demonstrated that net welfare loss occurs in equilibrium in which the good type borrower sustains loss in the case of adverse selection and both good and bad type of borrowers may sustain loss in the case of moral hazard problem. The analysis also suggests that the loan demand is price inelastic. It is further found that the absolute value of price responsiveness increases with interest rate and also it decreases with increasing value of family assets. Based on these findings it has been suggested that the policies which help in addressing these information asymmetry problems particularly loosening the incentive compatibility constraints of bad (poor) borrowers, such as loan guarantee, subsidies or other supports may increase efficiency.

Then using the household survey data from China and India, some of these results are empirically tested. Overall it has been found that large parts of people in these areas suffer from considerable amount of credit rationing. The significance of assets endowment and collateral posting ability has been found as important explanatory variables for credit rationing. Also a test has been proposed to test for information asymmetry in these credit markets and significant results are obtained. However the empirical findings would have been more robust if data on actual amount of collateral posted could have been obtained, but apparently this is difficult. Another improvement in empirical analysis can be made if some good instrument of interest rate is identified to take care of endogeneity of interest rate. Also if panel data on observations are available then unobserved heterogeneities can be controlled and also adverse selection and moral hazard effects can be separated in assessing the prevalence of information asymmetry in the credit market. Future research may pick up on these ideas and can come up with more insights on functioning of credit markets.

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APPENDIX 3.1

3.3.3 Sketch of Solution: The good borrower maximizes expected utility subject to the incentive compatibility condition of bad borrower and zero profit condition of the lenders. Other constraints in (3.7) can be shown to be satisfied.

$$\max_{\{r,C,L\}} p_i(A_i)U(g(A_i, L_i) + W_i - (1+r_i)L_i) + (1 - p_i(A_i)U(W_i - C_i(A_i)) \quad (3.12)$$

subject to

(i) Bank's profit $= p_i(1+r_i)L_i + (1-p_i)C_i - (1+\rho)L_i \geq 0 \quad : \lambda_1 \geq 0$

(ii) Incentive Compatibility condition for borrower j

$p_j(A_j)U(g(A_j, L_i) + W_j - (1+r_i)L_i) + (1 - p_j(A_j)U(W - C_i(A_i)) \leq V_{\text{first best}} \quad : \lambda_2 \geq 0$

(iii) Wealth constraint : $0 \leq C_i \leq W_i \quad : \lambda_3 \geq 0$

In the equilibrium first two constraints must bind ($\lambda_1 > 0, \lambda_2 > 0$). The competitive lending market ensures zero profit. The incentive compatibility of borrower j should also bind otherwise; good borrower will choose her first best contract. The type j borrower has incentive to pick up the contract of type i, hence in equilibrium the contracts will be offered such that her incentive compatibility constraint binds.

The concavity assumptions on U (.) guarantee that the program (3.12) can be analytically solved using Karush Kuhn Tucker (KKT) optimization conditions (necessary and sufficient) as following. It is assumed that the wealth constraint is not binding on the collateral requirements.

First the bank's zero profit condition implies

$$\Rightarrow p_i(1+r_i)L_i = (1+\rho)L_i - (1-p_i)C_i$$

$$\Rightarrow r_i = \frac{(1+\rho)-p_i}{p_i} - \frac{(1-p_i)C_i}{p_i L_i};$$

$$\text{For } C_i > 0; \Rightarrow \hat{r}_{i\ \text{signal}} < \hat{r}_{i\ \text{first bestl}} \qquad ..(3.13)$$

Now assuming that there are only two types (i refers good type (higher endomwment) and j refers bad type) of borrowers;

The langragian is written as following :

$$L(.) = p_i(A_i)U(g(A_i, L_i) + W_i - (1+r_i)L_i) + (1 - p_i(A_i)U(W - C_i(A_i)) +$$
$$\lambda_1 [p_i(1+r_i)L_i + (1-p_i)C_i - (1+\rho)L_i] +$$
$$+ \lambda_2[\bar{V} - p_j(A_j)U(g(A_j, L_i) + W_j - (1+r_i)L_i) - (1 - p_j(A_j)U(W_j - C_i(A_i))]$$
$$+ \lambda_3 [W_i - C_i] \qquad ...(3.14)$$

Now taking first order condition with repect to r_i

$$\Rightarrow p_i U'(g(A_i, L_i) + W_i - (1+r_i)L_i)[-L_i] + \lambda_1 [p_i L_i] + p_j \lambda_2 U'(g(A_j, L_i) + W_j - (1+r_i)L_i)[L_i] = 0$$

$$\Rightarrow p_i U'(g(A_i, L_i) + W_i - (1+r_i)L_i) = \lambda_1 [p_i] + p_j \lambda_2 U'(g(A_j, L_i) + W_j - (1+r_i)L_i) \qquad ...(3.15)$$

From equation (3.15) following inferences are drawn :

(i) As the left hand side is positive and further it dominates the first term on the right hand side (follows from the fact that indifference curve in r-C space is steeper than bank's isoprofit curve), then $\lambda_2 > 0$ and hence the borrower j's incentive compatibility binds. Alternatively, it can be shown by substituting r_i from zero profit constraint in the objective function and incentive compatibility constraint and ignoring the zero profit constraint and then $\lambda_2 > 0$ is conveniently obtained.

Then taking first order condition with respect to C_i :

$$\Rightarrow -(1-p_i)U'(W-C_i)+\lambda_1[1-p_i]+\lambda_2[(1-p_j)U'(W_j-C_i)]-\lambda_3=0$$

$$\Rightarrow U'(W_i-C_i)(1-p_i)-\lambda_2\,U'(W_j-C_i)(1-p_j)=\lambda_1[1-p_i]\;-\lambda_3 \qquad ...(3.16)$$

For suitable parametric values equation (3.16) gives the equilibrium value of collateral required to be posted by borrower i. Note that $\lambda_3 = 0$, otherwise the marginal conditions on utility will be violated.

Similarly taking first order derivatives with respect to L_i

$$\Rightarrow p_i U'(g(A_i,L_i)+W_i-(1+r_i)L_i)[g_L(A_i,L_i)-(1+r_i)]=$$

$$p_j\lambda_2[U'(g(A_j,L_i)+W_j-(1+r_i)L_i)[g_L(A_j,L_i)-(1+r_i)]-\lambda_1[p_i(1+r_i)-(1+\rho)] \quad ..(3.17)$$

Note that $p_i(1+r_i)<(1+\rho);\Rightarrow$ second term on Right hand side is positive. But the sign on first term on right hand side is indeterminate. Becuase the borrower j gets her first best contract; $\Rightarrow g_L(A_j,L_j)-(1+r_j)=0$, but with $r_i < r_j$, and $A_i > A_j$

$g_L(A_j,L_i)-(1+r_i)$ can be positive or negative.

Now the equation (3.17) helps in giving the equilibrium value of L_i

APPENDIX 3.2

5. A.2. Heckman Sample Selection Correction Methodology[11]

Equations 5.1 and 5.2 sum up decisions of borrowers and lenders related to demand and supply of loan. These can be further described as following. The borrower may or may not have a positive demand for credit. This decision is influenced by several variables such as age, sex, income, asset endowment, educational level, occupational status, health status, and also by some unobservables, such as, social status, government policies and so on. Then conditional on positive demand for loan the borrower decides on desired amount of credit which is also influenced by several covariates as mentioned above. Then the lender can deny, approve partially or approve fully the loan request. If loan application is denied then the borrower is type II credit rationed, if it is partially allowed then she is type I rationed, and if she gets desired amount of credit she is not rationed. Hence there are two selection equations. The first one describes that whether the borrower has positive demand for loan and the second one describes that whether the borrower gets desired amount of loan conditional on having positive demand for loan. The outcome equation describes the amount of loan obtained by households. The estimation strategy is described as following.

Now the propensity for loan demand function (binary variant of equation 3.4) is proposed as following:

$$B_d = 1(\mathrm{B}_\mathrm{d}^* = \beta \mathrm{X}_\mathrm{d} + \varepsilon_\mathrm{d} > 0) \quad : \varepsilon_\mathrm{d} \approx N(0, \sigma_d^2) \qquad \text{...(B1)}$$

Here B_d^* is the latent propensity of demand for loan. The observed variable is $\mathrm{B_d}$ - which is observed as 1 if the latent variable is positive, i.e. the borrower has positive demand for loan and zero otherwise. $\mathrm{X_d}$ is a vector of exogenous covariates, β is a vector of parameters,

[11] This discussion is based on, Maddala (1983) - Chapters 2, 3, 7 and 10, Kochar (1997), Greene (2003) – chapter 22, and Chen and Chivakul (2008).

ε_d is the random error term that is assumed to be normally distributed with zero mean and varaiance σ_d^2. It is assumed that $\sigma_d^2 = 1$, since β is identified upto a scalable factor only.

The supply function (binary variant of equation 3.5) is proposed as following, noting that supply is observed only for those observations who have positive demand for loan.

$B_s = 1(B_s^* = \delta X_s + \varepsilon_s > 0; \text{and } B_d = 1) : \varepsilon_d \approx N(0, \sigma_s^2)$ . ...(B2)

B_s is not observed if $B_d = 0$.

Hence, $E(B_s \mid B_d = 1) = \beta X_s + \rho\sigma_d\sigma_s \frac{\phi(\beta X_d)}{\Phi(\beta X_d)}$; where $\frac{\phi(\beta X_d)}{\Phi(\beta X_d)} = M_d$ (Inverse mills ratio factor) ,

obtained , from selection equation (B1) . Hence estimable supply propensity equation is shown as

$$B_s = \delta X_s + \rho\sigma_d\sigma_s \frac{\phi(\beta X_d)}{\Phi(\beta X_d)} + \varepsilon_s \qquad \text{...(B2)}$$

Here B_s^* is the latent propensity of supply of loan. The observed variable is B_s - which is observed as 1 if the latent variable is positive i.e. the borrower gets desired amount of loan and zero otherwise , i.e. the borrower is refused or gets less than desired amount of loan . X_s is a vector of exogenous covariates, δ is a vector of parameters, ε_s is the random error term that is assumed to be normally distributed with zero mean and varaiance σ_s^2. It is assumed that $\sigma_s^2 = 1$, since δ is identified upto a scalable factor only. ρ is correlation coefficient of the two error terms (ε_s, and ε_d)

Note that inverse mills ratio factor M_d is introduced, as supply of loan is observed only for the families who have applied for the loan.

Then latent model for desired amount of debt D* (equation 3.35) is formulated as following:

$$D^* = \gamma X + \varepsilon \qquad \text{...(B3)}$$

Where D* is desired amount of debt. X is a vector of covariates that influences this decision, γ is vector of parameters and ε is a random error term that is assumed to be

normally distributed with mean zero and variance σ^2.

$$D = D^*: \text{iff } I = 1\left(B_d^* = X_d\beta + \varepsilon_d \geq 0, (i.e. B_d = 1); \text{and } B_s^* = X_s\delta + \varepsilon_s \geq 0, (i.e. B_s = 1)\right) \ldots (B4)$$

Otherwise D is unobserved. Where $1(.)$ is an Indicator function.

It is assumed that $(\varepsilon, \varepsilon_d, \varepsilon_s)$ are trivariate normally distributed with zero mean and covariance matrix as following:

$$V = \begin{pmatrix} \sigma^2 & \rho_d\sigma & \rho_s\sigma \\ \rho_d\sigma & 1 & \rho \\ \rho_s\sigma & \rho & 1 \end{pmatrix} \quad \ldots (B5)$$

Now conditional expectation of D, conditional on satisfaction of selection condition is

$$E(D) = E(D^* | 1(.)) = \gamma X + E(\varepsilon | B_d^* > 0 \text{ and } B_s^* > 0)$$

$$B_d^* = \beta X_d + \varepsilon_d > 0; \text{ and } B_s^* = \delta X_s + \varepsilon_s > 0 \quad \Rightarrow \quad \varepsilon_d > -\beta X_d \text{ and } \varepsilon_s > -\beta X_s$$

Also it is assumed that $(\varepsilon_d, \varepsilon)$ and $(\varepsilon_s, \varepsilon)$ are bivariate normally distributed,

$$\text{Hence, } E(\varepsilon | B_d = 1) = \rho_d\sigma \frac{\phi(\beta X_d)}{\Phi(\beta X_d)} \quad \text{and} \quad E(\varepsilon | B_s = 1) = \rho_s\sigma \frac{\phi(\delta X_s)}{\Phi(\delta X_s)}$$

$$\text{Hence, } E(D) = E(D^* | 1(.)) = \gamma X + \rho_d\sigma \frac{\phi(X_d\beta)}{\Phi(X_d\beta)} + \rho_s\sigma \frac{\phi(X_s\delta)}{\Phi(X_s\delta)} \quad \ldots (B6)$$

Here $\frac{\phi(\beta X_d)}{\Phi(\beta X_d)} = M_d$ and $\frac{\phi(\delta X_s)}{\Phi(\delta X_s)} = M_S$ are Inverse Mills Ratio (IMR) from equations (B1) and (B2) that is obtained using "Probit" estimation of these equations - Heckman 2 step procedure.

Under the assumption of trivariate normal distribution, this model can be estimated using full information maximum likelihood method (FIML) – however the estimation gets complicated, when convergence is not assured.

Summarily the unconstrained debt equation (modified equation 3.35) is estimated as

$$D = \gamma X + \rho_d\sigma M_d + \rho_s\sigma M_s + \varepsilon \quad \ldots (B7)$$

Now if we have good number of sample observations on positive amount of debt which the persons are having, then ideally equations (B1), (B2) and (B7) can be estimated. Then the persons, for whom loan amount is less than the desired amount of loan, can be termed as credit rationed.

Chapter 4: Impact of Credit Constraints on Livelihood Choices

The main objective of this chapter is to investigate the impact of credit constraints on various aspects of livelihood choices such as, physical capital formation, human capital formation, agricultural inputs application, consumption smoothing, whether to become entrepreneur or wage seeker etc. The analytical results demonstrate that farm input applications and wage market outcomes are adversely affected by the binding credit constraints. Also the results demonstrate that consumption smoothing, and physical capital and human capital accumulation are adversely impacted by the binding credit constraints. Some of these results are empirically investigated. Using suitable econometric methods and using the household survey data from China and India; it has been shown that credit constraints negatively affect food consumption, farm inputs applications, and health and educational attainments.

4.1. Introduction

It is well known fact that credit markets function differently from the standard markets[12]. The standard competitive market of a homogenous good works on the premise that the agents are price takers, the delivery of good and the payment for the transactions happen simultaneously and the market clears at the prevailing market price. But the same presumptions do not hold in the functioning of credit market. There is a finite time lag in the delivery of credit and contracted repayment of that. Further the limited liability clauses and imperfect enforcement of contracts by the courts of law substantially contribute to loan defaults. Defaulting on repayment obligations is a fact of reality. Under such circumstances the price of credit (interest rate) may not be able to clear the market and there may be excess demand of credit –

[12] See, Jaffe and Stiglitz (1990). Credit Rationing, Chapter 16 for more on this.

and then credit rationing may occur. Stiglitz and Weiss (1981) demonstrated credit rationing based on imperfect information i.e. prevalence of asymmetry in information between the borrower and lender. Adverse selection and moral hazard of borrowers may engender backward bending credit offer curve, leading to credit rationing in equilibrium. These issues have been investigated in detail in Chapter 3.

There is a huge literature on the theory of credit rationing, but apparently less work is done on analyzing the impact of credit constraints on various aspects of livelihood choices such as, physical capital formation, human capital formation, agricultural inputs application, consumption smoothing, whether to become entrepreneur or wage seeker etc. The objective of this chapter is to make a modest contribution in filling that gap. This chapter intends to develop an analytical framework to analyze how credit constraints impact such livelihood choices of people[13]. Furthermore, the survey data from China and India is used to conduct empirical investigation of some of the results obtained.

Credit constraints affect the people in several ways. A large number of people depend on agriculture and ancillary activities in rural areas for their livelihood. These sectors demand upfront investment to generate income at a later date and constraints on borrowing may severely hinder the capital investment activities directly affecting the production process, and it may itself become a cause of persistent poverty[14]. The Credit constraints may affect acquisition of physical capital and human capital-education and health are important types of human capital (Schultz, 1993a).

Once credit constrained, the people generally respond in various ways such as adopting safe but low yielding technologies, low level of schooling, suboptimal level

[13] Credit constraints could mean – (i) Not able to get credit at all, (ii) get less of credit than desired , (iii) do not try to get credit, anticipating that loan application will be rejected. For formal definition see, Keeton (1979), and Stiglitz and Weiss (1981).

[14] Galor and Zeira (1993) is a good description in this regard.

of health care utilization etc. Several studies explain the effects of credit constraints on consumption in general, for example, Zeldes (1989), Hayashi (1985) and so on. Some of the studies including Morduch (1995), and Rosenzweig et al (1993), demonstrate income smoothing and consumption smoothing strategies of people who are credit constrained. Moreover, suboptimal level of investments in human capital in early phase of life cycle may influence earning potential and may become a persistent cause of poverty[15]. Becker (1975) is among the pioneers to highlight the issue of underinvestment in education, training and health because of imperfections of the capital market. He reasoned that it is difficult to borrow funds for investment in human capital activities (education, health etc.) as such capitals can not be offered as collateral. Following this Galor and Zeira (1993) is another significant work that attempts to explain the effect of imperfections in credit market on educational attainments. Jacoby (1994) conducts an empirical analysis of influence of borrowing constraints on schooling attainments in context of Peru. Another related work is that of Jacoby and Skoufias (1997) that attempts to unravel the underlying relationships of imperfections in financial markets and human capital accumulation in a risky environment in developing countries.

Most of these studies address the issues of credit constraint and consumption smoothing and also some of the studies have looked into human capital accumulation issues. However, not many studies appear to have investigated the effects of credit constraints on other aspects of livelihood choices mentioned earlier. Hence this chapter intends to develop an analytical framework to analyze how credit constraints

[15] Important references are Mincer and Polachek (1974), Beherman and Deolalikar (1987), Sahn, D. and H. Alderman (1988), Schultz, T.P. (1993), Thomas, D. and J. Strauss (1996), and Glewee, P. et al (2001).

impact such livelihood choices of people and also uses the survey data from China and India to conduct empirical investigation of some of the results obtained.

At the outset, it is clarified that the effect of borrowing constraints is not the same thing as the effect of income poverty on livelihood choices. Suppose a person is poor but if she does not face any credit constraints then she can borrow the required (optimal) amount of money from the credit market and repay it later- such that marginal cost of borrowing equals perceived marginal benefit of these choices. But if she is credit constrained then she has to forego these choices that may ultimately affect her well being. Also the borrowing constrainedness of a person can be explained by several covariates such as her educational and occupational status, income and wealth level, health status, other observable and non observable factors such as neighborhoods, social status, and government policies related to credit access etc. The people whose loan applications are rejected or who are hesitant to ask for a loan are termed as borrowing constrained.

Household surveys were conducted in rural areas of China (in years 2007 and 2008) and India (in year 2008-09). About 1500 families in China and 400 families in India were surveyed. The survey questionnaires are designed to elicit responses of the families related to - (i) the credit rationing problems which they face, (ii) how the credit rationing affects their livelihood choices, and (iii) how they respond to overcome this problem. This survey data provides good information on many variables related to credit constraints, and its felt impact on adequate food availability, farm input applications, and desired level of health and educational attainment.

The survey data reveals that more than 75 percent families in both the countries are compelled to use lower level of agricultural inputs because of borrowing constraints, also more than 90 percent families stated that they need to supplement their income by wage income as they are not able to do the farming to the desired extent because of

borrowing constraints. Furthermore, more than 50 percent families in India and about 25 percent families in China stated that they are not able to get adequate amount of food throughout the year because of borrowing constraints. Also more than 50 percent respondents in these countries said that they are not able to provide adequate level of health care and education to their family members. These rudimentary findings highlight the importance of borrowing constraints on important aspects of livelihood. The perceived impact of credit constraints is quantified along various dimensions such as inadequate food availability, lower level of input applications in farming, and less than desired level of health and educational attainment. A composite variable "Credit impact" is constructed using these variables, of which details are discussed in section four. The a-priori hypothesis is that people facing credit constraints face inadequate food availability, spend less on farm inputs and have lower level of health and educational attainments.

Suitable econometric methods have been used to test this hypothesis. We are primarily interested in the coefficient on the variable related to credit constrainedness, "Credit Constraint". Also as discussed earlier it is not an exogenous variable; rather it can be explained by several covariates. Hence first an estimation equation has been specified for "Credit Constraint", and then its predicted values have been used in the ensuing regressions. Probit regression method has been used to estimate the equation related with impact of the credit constraint. The results broadly demonstrate that the credit constraint is positively associated with the "Credit impact" variable.

The chapter is organized as following. Investigation of impacts of credit constraints on farm input applications and wage seeking has been done in section 2. The analysis has been done in a static optimization framework. The analysis of impact of the credit constraints on various livelihood choices such as, capital investment (physical and human), consumption, leisure, and decision to either become an entrepreneur or wage

seeker is presented in section 3. The analysis has been done in a dynamic optimization setting. Some of these results are empirically investigated in section four. The household survey data from China and India are used in this chapter to analyze the effect of the credit constraints on various livelihood choices such as, food security, agriculture input applications, and better health and educational attainments. The results and inferences are discussed in section four. Section 5 concludes with important observations.

4.2. Credit Constraints, Farm Input Applications and Wage Seeking

In this section, an analytical framework is developed to understand the impacts of credit constraints on farm input applications. Also using a variant of Harris and Todaro model of migration, effect of credit constraints on the wage seeking behaviors is analyzed. The analysis proceeds with the assumption that people are risk averse and they may face credit constraint.

Let the level of borrowing limit ($\bar{B}_{it}$) of a household i at time t is defined as a function of expected income in next period ($E_t y_{t+1}$) and poverty line (z_{t+1}). In one period context it may be treated as steady state level of borrowing net of repayment.

$$\bar{B}_{it} = \varphi(E_t y_{t+1}, z_{t+1}) \qquad \ldots(4.1)$$

The function φ (.,.) is non decreasing and concave in Ey_{t+1} and non increasing in z_{t+1}. Further if $\bar{B}_{it}$ decreases below a critical limit, $\bar{B}^*_{it}$, then households prefer wage labor[16].

[16] Farming may not be profitable if credit availability is restricted beyond a certain limit, and then wage income fetches more income than from farming activities.

4.2.1 Influences on Production Decisions

In agricultural production, variable inputs (seeds, irrigation, fertilizers etc.) are employed on fixed input (land). For production efficiency the optimal level of inputs should be such that the value of marginal product (MVP_i) is equal to marginal cost of input (MC_i). However if (MVP_i) > (MC_i), less than optimum input is used, and that leads to inefficient production.

Let us consider first simple case – when there is no uncertainty in production. For neatness time subscripts are ignored. The production function is described by

$$q = f(X): f`(X) > 0,\ f``(X) < 0,\ f(.) \text{ strictly concave in } X \qquad \ldots (4.2)$$

Where, X is vector of variable inputs. Let p be the price of product and w is the vector of input prices. Also I consider that the person need to buy the inputs from the market at prices w and her buying resources is bounded above by credit limit $\bar{B}$. The farmer chooses X to maximize her utility obtained from the profit income.

$\underset{X}{Max}\, u(\pi(X))$: where u(.) is a continuous , increasing and strictly concave function :

$$u`() > 0, u``() < 0. \qquad \ldots (4.3)$$

$s.t.\ w.X \le y + \bar{B}$: where y is a fixed amount of income

where $\pi(X) = p.f(X) - w.X$

Hence the maximization program is written as following :

$$L_x = u((pf(X) - w.X)) + \lambda(y + \bar{B} - w.X)$$

Now taking first order condition (f.o.c.) with respect to input X_i, the following neccessary and sufficient condition is obtained :

$$\Rightarrow u`(.)\,(p\, f_i`(X) - w_i) - \lambda w_i = 0. \qquad \ldots (4.4)$$

Now suppose that the borrowing constraint is not binding , then $\lambda = 0$ and so

$$u`(.)\,(p\, f_i`(X) - w_i) = 0 \qquad \Rightarrow (p\, f_i`(X) - w_i) = 0 \ (\text{since } u`(.) \neq 0)$$

$\Rightarrow p f_i`(X) = w_i \Rightarrow$ Optimum level of use of input i, as ... (4.5)

Marginal value product (MVP) of input i = Marginal cost (MC) of input i

But when borrowing constraint is binding : $\lambda > 0$ and then

$p f_i`(X) > w_i \Rightarrow MVP_i > MC_i$ and ...(4.7)

If we further differentaite the f.o.c., with respect to λ, the shadow price of borrowing constraint

$$\Rightarrow u``(.)(p f_i`(X) - w_i)^2 . \frac{dX_i}{d\lambda} + u`(.) pf_i``(X) . \frac{dX_i}{d\lambda} = w_i$$

Since $u``(.)$ and $f_i``(.)$ are neagtive and $u`(.)$ is positive, $\Rightarrow \frac{dX_i}{d\lambda} < 0$ ...(4.7)

The above result can be also demonstrated more clearly if we directly substitute, w.X= y+ $\bar{B}$, when the borrowing constraint is binding. Hence substituting w.X= y+$\bar{B}$, in equation (4.4), and then differentiating with respect to $\bar{B}$;

$$\Rightarrow u``(pf(X) - \bar{B})(pf_i`(X) - w_i)[pf_i`(X)\frac{dX_i}{d\bar{B}} - 1] + u`(.) pf_i``(X)\frac{dX_i}{d\bar{B}} = 0$$

$$\Rightarrow \frac{dX_i}{d\bar{B}} = \frac{u``(pf(X) - \bar{B})(pf_i`(X) - w_i)}{u``(pf(X) - \bar{B})(pf_i`(X) - w_i) pf_i`(X) + u`(.) pf_i``(X)} \quad ...(4.8)$$

Now with conditions of concavity on u(.) and f(.), both numerator and denominator are negative

And hence $\frac{dX_i}{d\bar{B}} > 0$

Also, when $X < X_{optimal}$, then $q = f(X) < q_{optimal} = f(X_{optimal})$

This derivation implies following result:

Result 4.1: The binding borrowing constraint leads to suboptimal level of input use in agricultural production activities. And more the constraint is binding (larger the shadow value of constraint), lower the level of input use. Alternatively the level of input application increases with increasing level of borrowing limit.

This result holds well when the uncertainty is introduced in the production function. Let the production function (Just and Pope, 1979) is

$q = f(X, \bar{B}_{it}) + h(X, \bar{B}_{it})\,\varepsilon.$ … (4.9)

Where, X is vector of variable inputs, ε is a stochastic disturbance, with E (ε) = 0 and V (ε) >0. f(X), and h(X, $\bar{B}_{it}$) are strictly concave(in X) and continuous functions. Let p_t be the price of product and w_t is the vector of input prices.

Hence the expected profit is, $\pi_t = p_t E [f(X, \bar{B}) + h(X, \bar{B})\,\varepsilon] - w_t.X$ ...(4.10)

Now risk averse farmer maximizes expected utility

$$\text{Max.}_{Xt}\ E_t [u(\pi_t)] \quad \ldots(4.11)$$

Subject to: $w.X \leq y + \bar{B}$

Ignoring time subscripts, the necessary and sufficient first order conditions are

$$E [u'(\pi)(pf_i + ph_i\,\varepsilon - w_i)] - \lambda w_i = 0, \forall i$$

$$\Rightarrow E[u'(\pi)]\,E[(pf_i + ph_i\,\varepsilon - w_i)] + Cov[U'(\pi), (pf_i + ph_i\,\varepsilon - w_i)] = \lambda w_i \ \forall i$$

$$\Rightarrow E[(pf_i + ph_i\,\varepsilon - w_i)] + Cov[u'(\pi), (pf_i + h_i\,\varepsilon - w_i)] / E[u'(\pi)] = \lambda w_i / E[u`(\pi)] \ \forall i \quad \ldots(4.12)$$

Since, $E [u'(\pi)] \neq 0$ (monotonicity assumption); following inferences are drawn:

Ideally in the complete market set up (when markets of land, labor, other inputs, credit, insurance, etc. are perfectly competitive) the utility maximization program is independent of profit maximization program. Complete separation is achieved for above two optimization programs[17] . The farmer first maximizes profit independent of his utility preferences and then simply uses the income out of this profit to maximize her utility.

$$\Rightarrow Cov [U'(\pi), (pf_i + h_i\,\varepsilon - w_i)] = 0 \quad \ldots(4.13)$$

But when any of these markets are not complete, then preferences may affect profit maximization program and there will be a feedback between theses optimizations.

$$\Rightarrow Cov [U'(\pi), (pf_i + h_i\,\varepsilon - w_i)] \neq 0 \quad \ldots(4.14)$$

[17] For more on this see, Udry (1996). "Efficiency and Market Structure: Testing for Profit Maximization in African Agriculture". http://www.econ.yale.edu/~cru2/pdf/separate.pdf

Hence when all the markets are complete (including no borrowing constraint), then using equations (4.13), (4.14), and $\lambda = 0$, we get

$$E[pf_i(.) + h_i(.)\varepsilon] = w_i \Rightarrow pf_i(.) = w_i \Rightarrow MVP_i = MC_i \quad \ldots (4.15)$$

The equation (4.15) implies the optimal level of input use.

But realistically, such separation is missing in presence of constrained credit and insurance markets. Now the production decisions are such that the marginal return on investment is positively correlated with income, and since marginal utility of income decreases with income, the covariance term turns to be negative. Consequently using equations (4.12), (4.14), and $\lambda > 0$, we get

$$E[pf_i(.) + h_i(.)\varepsilon] > w_i \Rightarrow pf_i(.) > w_i \Rightarrow MVP_i > MC_i \quad \ldots (4.16)$$

Again implication of equation (4.16) is that suboptimal levels of inputs are employed. In presence of uncertainty, Result 1 gets amplified - in the sense that even if there is no borrowing constraint, but suppose that insurance needs are not fully met, then the covariance term drives the sub optimality result. Lack of insurance opportunities induces feedback between the profit maximization and utility maximization programs. People are compelled to apply sub optimal level of inputs (with using less of X, uninsured losses in the case of bad outcomes are reduced). These observations are noted in Result 4.2.

Result 4.2: In the case of uncertainty in production, Result 1 gets amplified. Incompleteness of other markets (say insurance markets) through the covariance relation of profit maximization and utility maximization program strengthens the suboptimal level of input use. To clarify this, suppose that there is no borrowing constraint, but if insurance requirements are not fully met, then still suboptimal level of inputs will be used.

The upshot of this result is that when the farmers realistically face lot of downside risk in agricultural production, then availability of insurance markets are as important as that of credit markets. This can be demonstrated using above set up as following.

Let there be no credit constraint, hence $\lambda = 0$.

Now consider that there are insurance opportunities available such that when bad state occurs (income less than mean level of π); she gets insurance payments and she pays premium in all the states. The payments are such that the income is smoothed across all the states of outcome. Hence now,

$u`(\pi_s + t_s) = \mu$: for all states $s \in S$; t_s is net insurance payment in state s …(4.17)

This implies that now covariance term is zero.

Using the equation (4.17) in the equation (4.12) and noting that $\lambda = 0$

$\Rightarrow E[(pf_i + ph_i \varepsilon - w_i)] + Cov[u'(\pi), (pf_i + h_i \varepsilon - w_i)] / E[u'(\pi)] = \lambda w_i / E[u`(\pi)] \ \forall i$

$\Rightarrow E[(pf_i + ph_i \varepsilon - w_i)] = 0 \ \Rightarrow p f_i = w_i \ \Rightarrow MVP_i = MC_i$

Thus with no borrowing constraints and with provision of adequate insurance use of optimal level of input is now possible.

4.2.2 Wage Market Outcome

Borrowing constraints may also influence outcomes in wage market. In rural areas a large number of households depend on wage market for their livelihood. Also with increasing borrowing constraint the borrower may not be able to arrange requisite amount of inputs for farming at remunerative prices; and if credit constraint tightens beyond a limit, then families may prefer wage labor as it may fetch more income than the income from farming. Thus apparently number of wage seeker may increase with increasing borrowing constraints and that my put downward pressure on wages. In this background, a variant of Harris and Todaro (1970) two sector model of rural economy

seem to be an appropriate framework to investigate this issue. The analysis proceeds with following assumptions:

(a) Two sectors – one farming and another ancillary sector (food processing etc.) exist in rural areas. The credit constrained families seek employment in both sectors. (b) As argued in section 2.1, in presence of borrowing constraints farming sector pays wage less than the value of labor marginal productivity. (c) The ancillary sector pays wage equal to marginal productivity. The model is described as following.

Let Y_1 = agriculture output, L_1 = labor force in agriculture, A = technology level, Land is fixed input, say =1.

$Y_1=A\ (L_1^{\beta} + L_1^{\alpha}\ \varepsilon), 0<\alpha, \beta \leq 1,$ …(4.18)

ε: stochastic disturbance, E (ε) = 0 and V (ε) >0

The ancillary sector uses capital (K) and labor (L_2). Let C= level of technology, the ancillary production Y_2 (no uncertainty) is, $Y_2 = CK^{\alpha}L_2^{1-\alpha}$, $0<\alpha\leq 1$. … (4.19)

The marginal product of labor, $\partial Y_2 / \partial L_2 = (1-\alpha)\ Y_2 / L_2$ … (4.20)

It is assumed that the ancillary sector functions on the hypothesis of profit maximization; hence wage (w_2) in this sector equals its marginal product value.

$$w_2^* = (1-\alpha)CK^{*(\alpha)}L_2^{*(-\alpha)} \quad \ldots(4.21)$$

Let, p = relative price of agriculture goods (in terms of ancillary good), determined as following[18]: $p = \rho(Y_2/Y_1)$: $\rho` > 0$ …(4.22)

The expected marginal product of labor in agriculture

$$= E\left[\partial Y_1 / \partial L_1\right] = \beta Y_1/L_1^* \Rightarrow w_1^* = p\beta A(L_1^*)^{\beta-1} \quad \ldots(4.23)$$

[18] A sufficient condition for this assumption is that all agents in the economy have same homothetic preferences.

Also it is assumed that the ancillary sector is not credit constrained, hence K* is pinned down by equating marginal productivity of capital to the borrowing interests rate r.

$$\Rightarrow r^* = CK^{*(\alpha-1)}L_2^{*(1-\alpha)} \quad \ldots(4.24)$$

Now in the spirit of Harris and Todaro model, wage in agricultural sector (w_1) is proportional to w_2 and coefficient of proportionality (k (L_1)) is less than 1 and k_1 ` (.) <0. This ensures continuous flow of labor from farming sector to ancillary sector[19].

Now let at any instant, $L_1^* + L_2^* + L_t = L$ … (4.25)

Since sum of optimal amount of labor in both sectors (labor input such that marginal productivity equals wage in these sectors) may not be able to clear the labor market and there will be additional labor force looking for employment in these sectors. Now tighter the borrowing constraint is more the number of wage seeker will be and so bigger will be L_t. The job- searchers first try to get higher wage job w_2^*, but only L_2^*, can be accommodated there. So $L-L_2^*$ (= $L_1^* + L_t = L_1$), which may be bigger than L_1^*, get accommodated in agriculture sector depressing the wage there to w_1- i.e.

$$w_1 = w_1^*.L_1^* /(L-L_2^*) = w_1^*.L_1^*/L_1 < w_1^* \quad \ldots (4.26)$$

Now in equilibrium the expected wages in both sectors are same

$\Rightarrow$ w_2^*.Probability of getting employment in ancillary sector = w_1

$$\Rightarrow w_2^*.(L_2^*/L_2^*+L_t) = w_1 = w_1^*.(L_1^*/L_1) = w_1^*.(L_1^*/L_1^*+L_t) \quad \ldots(4.27)$$

And the labor market clears

$$\Rightarrow L_1 + L_2^* = L \quad \ldots (4.28)$$

Solving these set of equations (4.18 to 4.28) the equilibrium outcomes of production level, wages, prices, and employment levels in both sectors, ($Y_1, Y_2, p, w_2^*, w_1, w_1^*$,

[19] In Harris and Todaro (HT) model k is a function of (L_1 and L_2). Ancillary sector absorbs laborers on first come first serve basis upto its capacity.

$K^*, L_2^*, L_1,$) are determined[20]. Using these equilibrium values, we can carry out comparative statics analysis which may elicit informative results. Using, $w^*_2 = p\,(1-\alpha)\,BK^{*\alpha}L_2^{-*\alpha}$, and $w_2^*.\,(L_2^*/L_2^*+L_t) = w_1$, the following comparative statics are obtained.

$$\frac{\partial w_2^*}{\partial L^*_2} \le 0 \qquad \text{...(4.29)}$$

$$\frac{\partial w_1}{\partial L^*_2} \ge 0 \qquad \text{and} \qquad \frac{\partial w_1}{\partial L_t} \le 0 \qquad \text{...(4.30)}$$

These findings are summarized in the following result:

Result 4.3: Constraints on borrowing increases the number of job seekers in rural areas. In the framework of Harris and Todaro equilibrium model of migration and wages, higher level of wages in ancillary sector absorbs number of laborers upto its optimal level and farming sector absorbs additional job seekers that puts downward pressure on wages in this sector. Wage laborer gets less than its marginal value product in farming sector. And wages in this sector is a decreasing function of number of additional job seekers.

4.2.3 Determination of Critical Borrowing Limit

Essentially it has been asserted that farming operations require appropriate amount of credit. It follows that if level of credit decreases beyond a critical limit, wage labor fetches more income than the income from farming[21]. Now a brief analytics is presented here to derive that critical level of $\bar{B}^*$; $\bar{B}^*$ is identified as that level of borrowing constraint, such that the borrower is indifferent between farming and seeking employment in any of the above sectors. The analysis is as following:

[20] The household sector part analysis is in background here – assuming that preferences are such that labor supply (L) matches labor demand (L), and demand for both goods separately matches to Y_1 ,and Y_2.

[21] Two explanations: (i)With increasing borrowing constraint the borrower may not be able to arrange requisite amount of inputs for farming at remunerative prices, (ii) Many of the vulnerable poor people may not be having farming land and so they depend on wage market for their livelihood

The income from farming is: $\pi = pf(X) + H(X)\varepsilon + w.X$

Using equations (4.15) to (4.19) ; following cases of utility maximization program are obtained.

$$\mathrm{Eu}(\pi) = \mathrm{Eu}(pf(X^*) + h(X^*)\varepsilon - w.X^*) \quad \text{...(4.31) : credit constraint non binding}$$

$$\mathrm{Eu}(\pi) = \mathrm{Eu}(\mathrm{pf}(\bar{\mathrm{X}}) + h(\bar{\mathrm{X}})\varepsilon - \bar{B}) : \ \bar{\mathrm{X}}, \text{such that } \mathrm{w}.\bar{\mathrm{X}} = \bar{B} \quad \text{..(4.32) : credit constraint binding}$$

Now expected wage can be defined as a fraction of that obtained from ancillary sector :

$$\text{wage} = \mathrm{w}_{eql.} = \gamma(1-\alpha)CK^{*\alpha} L^{*-\alpha}_2$$

$$\textit{Hence } \mathrm{u}(\mathrm{w}_{\mathrm{eql}}) = \mathrm{u}(\gamma(1-\alpha)CK^{*\alpha} L_2^{-\alpha}) \quad \text{...(4.33)}$$

Hence $\bar{B}^*$ can be identified as that value of $\bar{B}$, such that the person is indifferent between farming and seeking employment in farming or ancillary sector, hence

$$\mathrm{Eu}(\mathrm{pf}(\bar{\mathrm{X}}) + h(\bar{\mathrm{X}})\varepsilon - \bar{B}) = \mathrm{u}(\gamma(1-\alpha)CK^{*\alpha} L_2^{*-\alpha})$$

$$\Rightarrow \bar{B}^* = \bar{B}^*(\gamma, \alpha, C, K^*, L_2^*) \quad . \quad \text{..(4.34)}$$

Equation (4.34) pins down the critical value of borrowing limit. The comparative statics of this equation suggests that (after replacing, $\overline{X} = \overline{B}/w$)

$$\frac{\partial \overline{B^*}}{\partial K^*} > 0; \quad \text{and} \quad \frac{\partial \overline{B^*}}{\partial C} > 0 \quad \text{… (4.35)}$$

Also as level of credit availability increases, farming becomes more remunerative and less is the number of job seekers and hence less is downward pressure on wages. Let $\bar{B}^*$ is the critical borrowing limit. Now suppose the critical borrowing limit increases then value of cumulative density function G($\bar{B}^*$) also increases . G($\bar{B}^*$) is interpreted as fraction of households whose critical borrowing limit is below $\bar{B}^*$. Now the households whose critical borrowing limit is beyond $\bar{B}^*$, for them farming is not remunerative and they become the job seekers. Implicitly it implies that as credit availability increases, more numbers of families get credit beyond the critical

borrowing limit and the number of wage seekers decreases in both sectors. The following comparative statics is evident.

using $L_1 + L_2^* = L(1 - G(\bar{B^*}))$

$$w^*_2 = (1-\alpha)BK^{*\alpha} L_2^{*-\alpha} = (1-\alpha)BK^{*\alpha} (L(1-G(B^*)) - \bar{L}_1)^{-\alpha}$$

$$\frac{\partial w^*_2}{\partial \bar{B^*}} = -\alpha(1-\alpha)BK^{*\alpha} (L(1-G(B^*)) - \bar{L}_1)^{-\alpha-1}.[-L\frac{\partial G(\bar{B^*})}{\partial \bar{B^*}}]$$

$$Now, \frac{\partial G(\bar{B^*})}{\partial \bar{B^*}} = g(\bar{B^*}) : density \text{ function} \geq 0$$

$$\Rightarrow \frac{\partial w^*_2}{\partial \bar{B^*}} \geq 0 \qquad \text{similarly} \quad , \qquad \frac{\partial w_1}{\partial \bar{B^*}} \geq 0 \qquad \ldots(4.36)$$

These observations are summarized in Result 4.4.

Result 4.4: As the limit of critical borrowing constraint increases (implicitly the availability of credit increases), the number of people searching for both farming and ancillary sector employment decreases. This increases equilibrium wage both in ancillary sector and also in farming sector.

This simple analysis explains that, with increasing borrowing constraint, the income earning prospect of the poor people may deteriorate and it may itself become a cause of persistent poverty. Hence understanding the determinants of credit constraints and resolving such constraints is an important policy question.

4.3. Borrowing Constraints and Livelihood Choices

In this section I will attempt to find answers for the following simple question: "How a credit constraint can affect an agent's decision of accumulation of physical capital, human capital (schooling) – that may impact her choice of profession (entrepreneur or worker) and thus her income, consumption and leisure choices?"

Some of these questions are investigated in static setting in section 2. However the process of borrowing, investment, outcome, consumption, and repayment evolves over time in an individual's life cycle. Hence learning the dynamics (and steady state equilibrium –if that exists) of these choice variables may strengthen our understanding of influence of borrowing constraints on life cycle paths of these variables. This section attempts to analyze the effects of borrowing constraints on above choices of an individual over her life cycle.

In recent literature several papers have analyzed the affects of borrowing constraints on consumption path during the life cycle of a representative agent.[22] In a significant empirical study, Zeldes (1989) found that an inability to borrow against future labor income affects the consumption of a significant portion of population. His estimations indicated that, borrowing constraints caused annual food consumption growth 1.7 percentage points higher compared to the situation of no such constraint. Deaton (1991,1993) observed that the precautionary demand for savings interact with borrowing constraints to provide a motive for holding assets which induces postponement of present consumption; however it is empirically difficult to separate out the effects of precautionary saving motives and that of borrowing constraints.

Gregorio (1996) studied the effect of borrowing constraints on human capital accumulation and economic growth. He has used overlapping generation model with endogenous growth framework. He observed that, borrowing constraints increases aggregate savings and this may increase growth, but he also observed that, by reducing human capital accumulation it may negatively affect the economic growth.

Bernhardt and Backus (1990) studied the effect of borrowing constraints on occupational choice and labor supply decisions. They have used life- cycle theory of labor supply and consumption decisions framework. They observed that, (i)

[22] Deaton (1991, 1993), and Zeldes (1989) are important references on this.

consumption is non-decreasing and is increasing when the borrowing constraint binds, (ii) labor supply is increasing at t=0, but decreasing near the terminal date T, when the borrowing constraint binds. They also observed that, if the worker switches from one profession to another profession – then the switch is from low skill profession to higher skill profession.

However these papers have not used borrowing rate or debt explicitly in their models and so the study of debt dynamics and evaluation of steady state optimal values of debt have been left unattended. Moreover a comprehensive model that attempts to analyze the effect of borrowing constraints on the decisions related to consumption, leisure, accumulation of physical capital and human capital, job choices and their mutual interrelations in a life cycle framework has not been apparently studied. This chapter attempts to conduct such an integrated analysis.

First a simple example is presented – which demonstrates that the stochastic income process of a poor person may endogenously spur the credit constrainedness[23].

Consider a person - whose income (y_t) is stochastic over time and uniformly distributed as following: $y_t \in [l, g]$: uniformly distrubuted: $y_t = (g - l)u_t + l$;

u_t is a random number uniformly distributed and $u_t \in [0,1]$.

Minimum level of subsistence consumption $= c_{min}$, and $l \le c_{min} \le g$: (poor in this sense).

Let there be no constraint on borrowing :

Borrowing or repayment in any period $= b_t = c_{min} - y_t$

Assume discount rate $= \rho$, and interest rate on borrowing/saving $= 0$

Now if there is no default, then $\sum_{t=0}^{t=\infty} e^{-\rho t} b_t = 0$

However for different values of : l and g , such that, $l < c_{min} < g$, and $(l + g)/2 = c_{min}$,

[23] I am thankful to Prof. Jon Conrad, for suggesting this analysis.

in many of the Monte - Carlo simulations , it is observed that $\sum_{t=0}^{t=\infty} e^{-\rho t} b_t < 0$

This implies that there is a finite probability of non-zero level of default, and such non-zero default probability may endogenously engender borrowing constraints. Table 4.1 presents some of the results of such simulation.

Table 4.1: Monte Carlo Simulation Results of Endogenous Borrowing Constraint

Simulation	*g*	*l*	*Mean*	*c*	*Probability of default*
1	6	2	4	4	0.5
2	5	3	4	4	0.45
3	4.5	3.5	4	4	0.42
4	5	3.5	4.25	4	0.05
5	5.5	3	4.25	4	0.2
6	7	2	4.5	4	0.2
7	7	3	5	4	0.02
8	8	3	5.5	4	0.01

Some of the noteworthy points are as following:

1. More the income in bad state (l) decreases (keeping the mean income same), more the probability of default increases – this highlights the high downside risk to income process in rural areas.
2. Even the mean of income is larger than the subsistence consumption level; there is always a non zero probability of default. This highlights the risk of uncertainty in income process in rural areas.

Now a general set-up is presented as following.

4.3.1 Borrowing Constraint and Livelihood Choices

Here effects of borrowing constraints on a person's livelihood choices-related to borrowing, consumption, leisure, choice of job, and accumulation of physical capital and human capital over her life cycle is investigated in a dynamic optimization

framework. Before description of the model is presented, a brief note on the main features of dynamic optimization methodology is presented.

In the maximum principles (using Hamiltonian)[24], the value of co-state variables are interpreted as shadow price or value of an additional unit of that state variable. The current value Hamiltonian corresponds closely to the economist's notion of current income. The value function V(c(X),h(X)) , is a concave , non decreasing, and non negative function. Also when the optimized value function is obtained, its marginal value with respect to a state variable equals the value of the corresponding co-state variable.

$\Rightarrow \cos state \text{ var } iable = \lambda_X(t) = V'(X^*(t))$. Here X is vector of state variable.

For example, value of $\lambda_K(t)$ implies that – how much value of the optimized value function increases by usage of one additional unit of state variable K. And also when the current value Hamiltonian is optimized, it is characterized as

$H_C(X^*(t), \lambda(t)) = \rho V(X^*(t))$.

The above equation implies that optimized H_C is income or return on wealth V.

Maximizing the Hamiltonian implies that net income (H_C) – with net investment evaluated at its correct efficiency price is being maximized at each instant of time (Weitzman: 103). The first order necessary and sufficient conditions (maximal conditions, co-state equations and transversality conditions) describe an economy wide dynamic competitive equilibrium with a perfect capital market. This synthesizes optimization over time and market equilibrium over time and in the words of Weitzman (104) – "Each representative agent in the competitive federation is optimizing the same optimal control problem against the external world, but internally all must compete for capital on perfectly competitive capital markets." And when we add constraints on this optimization program – then constrained optimal solutions may

[24] Good references on this topic are: (1) Weitzman, M.L.(2003). (2) Kamien and Schwartz (1991)

be a corner solution (Maximum Rapid Approach Path (MRAP)) or interior solutions – that may reduce the value of the optimized value function (in the case of corner solution) in comparison to that of unconstrained program.

The effects of borrowing constraint are of central importance here and hence effects of risk and uncertainty are assumed away and a deterministic framework is used.

The analytical model is described as following. Here time subscripts represent values of relevant variables at time t.

c_t = Consumption ; K_t = Amount of physical capital ; H_t = Amount of human capital

B_t = Amount of debt; b_t = Rate of borrowing ; rB_t = Interest payments on debt.

sB^{σ} = set up cost of debt ; Time endowment = 1;

Time spent on education = h_t ; Time spent on leisure = γ_t; $0 \le \gamma_t \le 1$;

Time spent on work = $(1 - h_t - \gamma_t)$;

I_t, h_t = Investment Rate of Physical Capital, human capital

ν = A decision variable of professional choice : 1 = entrepreneur; 0 = wage earner

w_t = wage rate = Marginal productivity of labor ; r_t = Marginal productivity of capital.

The representative agent maximizes discounted streams of lifetime utility as following:

$$V(K,H,B) = \underset{\{c>0,h\ge 0,b\ge 0,\nu=(0,1),0\le\gamma\le 1\}}{Max} \int_0^T e^{-\rho t} u(c,\gamma)\,dt$$

u(.) : concave, monotone, and well behaved utility function ; ρ = discount rate

s.t. $\dot{K} = y + b - \delta K - c - rB - sB^{\sigma}$: $0 < \delta < 1$; $\dot{K} = \partial K / \partial t$; $s > 0$; $0 < \sigma$.

$\dot{H} = \theta h^{\beta} K^{\phi} H^{1-\phi} - dH$: $0 \le \phi \le 1; 0 < \beta < 1$; $K > 0, H > 0$

$\dot{B} = b^{\eta}$: $\eta \ge 1$ ...Program (P1)

$f(.) = AK^{\alpha}H^{1-\alpha}; 0 \le \alpha \le 1;$ production function, concave and well behaved.

$y = [\nu f(K,H) + (1-\nu)wH](1-h-\gamma): \nu = 1 \text{ or } 0; \quad 0 \le \gamma \le 1$

$B \le aK + \psi H$ (Borrowing Limit): $a, \psi \ge 0$: μ_B = constraint coefficient

$B_0 + \int_0^T e^{-rt} b_t dt \le \bar{B}$: μ_T = constraint coefficient

at $t = 0, K(0) = K_0, B(0) = B_0, H(0) = H_0$

and $\underset{T \to \infty}{\text{Limit}}\, e^{-\rho T} \lambda_T S_T = 0$: S = State Variable; λ = Co-State Variable

The decision Variables are: c, b, h, γ, ν. The state Variables are: K, B, H

The lagrange multiplier coefficients on constraints are: μ_B, μ_T

The current value hamiltonian: H_C is

$$H_C = u(c,\gamma) + \lambda_K[y + b - \delta K - c - rB - sB^{\sigma}] + \lambda_H[\theta h^{\beta} K^{\phi} H^{1-\phi} - dH]$$

$$+ \lambda_B[b^{\eta}] + \mu_B[aK + \psi H - B] + \mu_T[\bar{B} - B_0 - \int_0^T e^{-rt} b_t dt]$$

The first order necessary and sufficient conditions and relevant observations follow.

1. $\frac{\partial H_C}{\partial c} = u_1(.,.) - \lambda_K = 0 \Rightarrow u_1(c,\gamma) = \lambda_K$ ...(4.37)

Equation (D1) suggests that along optimal path c_{opt} is chosen such that marginal utility of consumption equals marginal gain from capital investment.

2. $\frac{\partial H_C}{\partial b} = \lambda_K + \lambda_B \eta b^{\eta-1} - \mu_T / r = 0$ ...(4.38)

$\Rightarrow \lambda_B = -\lambda_K / \eta b^{\eta-1} + \mu_T / r$ also $\eta b^{\eta-1} = (\mu_T / r - \lambda_K) / \lambda_B$

$\Rightarrow$ Here evidently $\lambda_B < 0$. Equation (4.38) suggests that when life time borrowing constraint binds ($\mu_T > 0$), then borrowing rate decreases or even becomes neagtive. Here λ_K signifies marginal gain from borrowing and λ_B signifies marginal cost of borrowing. These findings are summarized in result 4.5.

Result 4.5: When the marginal gain from borrowing is more than the marginal cost of borrowing, then optimally borrowing rate increases and in the reverse case borrowing rate decreases and possibly repayment is made. However this optimality is not achieved in presence of binding constraints on the life time borrowing limit.

However, in ensuing analysis it is assumed that above constraint does not bind, i.e. $\mu_T = 0$.

Hence, $\Rightarrow \lambda_B = -\lambda_K / \eta b^{\eta-1}$ ...(4.39)

$$3.\frac{\partial H_C}{\partial h} = -\lambda_K(\nu f(K,H) + (1-\nu)wH) + \lambda_H \theta K^{\phi} H^{1-\phi} \beta h^{\beta-1} = 0$$

$$\Rightarrow \lambda_K(\nu\ f(K,H) + (1-\nu)wH) = \lambda_H \theta\beta h^{\beta-1} K^{\phi} H^{1-\phi} \quad ...(4.40)$$

The equation (4.40) suggests that, along optimal path h_{opt} is chosen such that the gain of marginal value of work equals the marginal productivity of human capital investment.

i.e. $MV_{work} = MP_{Human\ \text{Capital investment}} \Rightarrow h_{opt}$

It also implies, along optimal path (under conditions): $\frac{\partial h_{opt}}{\partial K_{opt}} \geq 0; \frac{\partial h_{opt}}{\partial H_{opt}} \geq 0$

Conditions are: for $\frac{\partial h_{opt}}{\partial K_{opt}} \geq 0; \phi > \alpha$ and for $\frac{\partial h_{opt}}{\partial H_{opt}} \geq 0; \alpha > \phi;$

These findings are summarized in result 4.6.

Result 4.6: Along optimal path, the part of time endowment devoted to schooling is such that the marginal productivity of human capital investment equals the marginal value of work. Also when marginal productivity of human capital investment exceeds that of physical capital investment, then optimal value of human capital investment is an increasing function of physical capital and human capital level.

$$4.\ \frac{\partial H_C}{\partial \gamma} = u_2(\mathrm{c},\gamma) - \lambda_K(\nu f(K,H) + (1-\nu)wH) = 0 \qquad ...(4.41)$$

The equation (4.41) suggests that along optimal path , γ^* (fraction of non school time for leisure) should be chosen such that the marginal gain of utility from leisure equals that of marginal value obtained from work.

$$\Rightarrow \gamma^*, such\ \text{that}: \quad \mathrm{MU}_{\mathrm{Leisure}} = \mathrm{MU}_{\mathrm{Work}} \qquad ...(4.42)$$

Result 4.7: Along optimal path, the non schooling time should be so divided between leisure and work, such that, marginal utility of leisure equals marginal value of work.

Now ν is a binary choice variable , such that $\nu = 1$; If income from entrepreneureship is larger than income from wage works, otherwise, $\nu = 0$. This suggests that along optimal path , a function $\eta(\mathrm{K},\mathrm{H},\mathrm{B}) = 0$ exists , such that

$$\eta(\mathrm{K},\mathrm{H},\mathrm{B}) > 0 \Rightarrow \nu = 1 \quad \text{and } \eta(\mathrm{K},\mathrm{H},\mathrm{B}) < 0 \Rightarrow \nu = 0.$$

$$\text{and } \eta(\mathrm{K},\mathrm{H},\mathrm{B}) = [\mathrm{f}(\mathrm{K},\mathrm{H}) - \mathrm{wHl} - \mathrm{rK}] - \mathrm{wH}. \qquad ...(4.43)$$

Along optimal path, optimal values of (K, H) may be different under the two regimes. Hence if borrowing constraint affects accumulation of physical capital more, then an entrepreneur may become wage seeker. Above findings are summarized in result 4.8.

Result 4.8: Along optimal path, if net earning from entrepreneurship is larger than the net income from wage works, then agent chooses to be entrepreneur. As borrowing constraints affect accumulation of physical capital and human capital and if the marginal effect is different then borrowing constraint may compel an entrepreneur to become wage seeker or vice versa. This description is graphically shown in Figure 4.1.

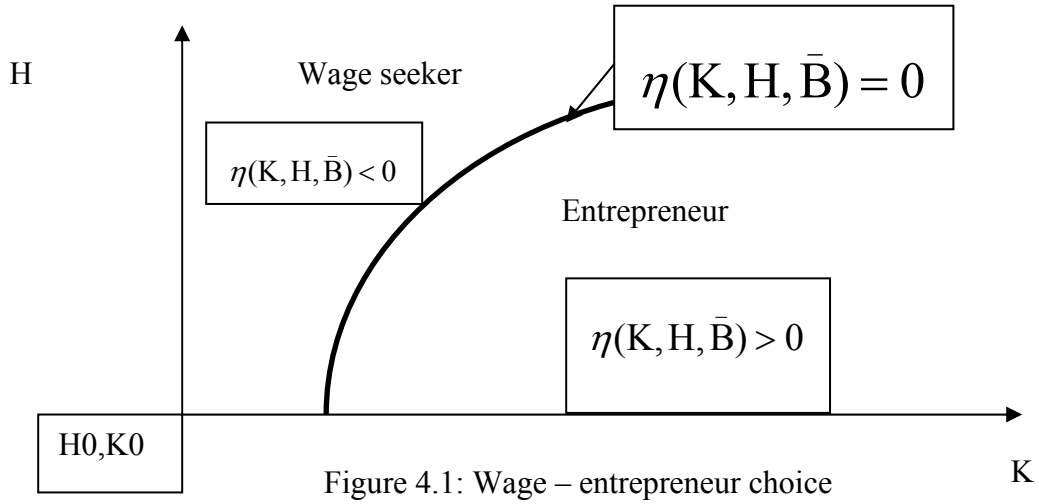

Figure 4.1: Wage – entrepreneur choice

Before examining the co-state equations, the dynamics of equations (4.37), (4.38), (4.39) and (4.40) are analyzed.

$$u_1(c,\gamma)=\lambda_K \qquad ...(4.37)$$

$$\lambda_B = -\lambda_K/\eta b^{\eta-1} \qquad ...(4.38)$$

$$\lambda_K(\nu\ f(K,H)+(1-\nu)wH)=\lambda_H\theta\beta h^{\beta-1}K^{\phi}H^{1-\phi} \qquad ...(4.40)$$

$$u_2(c,\gamma)-\lambda_K(\nu f(K,H)+(1-\nu)wH)=0 \qquad ...(4.41)$$

If $\nu=1$ assumed then equation (4.41) is simplified as following:

$$u_2(c,\gamma)=u_1(c,\gamma)AK^{\alpha}H^{1-\alpha} \qquad ...(4.41)$$

Differentiating equation (4.37) with respect to time, $\Rightarrow u_{11}(c,\gamma)\dot{c}=\dot{\lambda}_K$ ...(4.44)

Then taking log of equation (4.39) and differentiating with respect to time implies:

$$\Rightarrow \frac{\dot{\lambda}_B}{\lambda_B}=\frac{\dot{\lambda}_K}{\lambda_K}-(\eta-1)\frac{\dot{b}}{b}$$

$$\Rightarrow \frac{\dot{\lambda}_B}{\lambda_B}=\frac{u_{11}(c,\gamma)\dot{c}}{u_1(c,\gamma)}-(\eta-1)\frac{\dot{b}}{b} \qquad ...(4.45)$$

For ensuing analysis it is assumed that agent optimally prefers entrepreneurship, ν=1.

Similarly taking log of equation (4.40) and differentiating with respect to time implies :

$$\frac{\dot{\lambda}_H}{\lambda_H} = \frac{u_{11}(c,\gamma)\dot{c}}{u_1(c,\gamma)} + (\alpha - \phi)\frac{\dot{K}}{K} + (\phi - \alpha)\frac{\dot{H}}{H} + (1-\beta)\frac{\dot{h}}{h} \qquad ...(4.46)$$

Also taking log of equation (4.41) and differentiating with respect to time implies:

$$\frac{u_{22}(c,\gamma)\dot{\gamma}}{u_2(c,\gamma)} = \frac{u_{11}(c,\gamma)\dot{c}}{u_1(c,\gamma)} + (\alpha)\frac{\dot{K}}{K} + (1-\alpha)\frac{\dot{H}}{H} \qquad ...(4.47)$$

Now dynamics of co - state equations are analyzed as following.

$$1.\ -\frac{\partial H_C}{\partial K} = -[-\lambda_K\delta + (\nu f_1(.,.) + (1-\nu)w_K H)\lambda_K(1-h-\gamma) +$$

$$+ \lambda_H\theta\phi h^{\beta}(\frac{H}{K})^{1-\phi} + \mu_B a] = \dot{\lambda}_K - \rho\lambda_K \qquad ...(4.48)$$

Substituting for $\dot{\lambda}_K$ and λ_K using equations, (3.1) and (3.8) leads to following expression

$$\Rightarrow \frac{u_{11}(c,\gamma)\dot{c}}{u_1(c,\gamma)} - \rho = \delta - (\nu f_1(.,.) + (1-\nu)w_K H)(1-h-\gamma) - \frac{\lambda_H}{\lambda_K}\theta\phi h^{\beta}(\frac{H}{K})^{1-\phi} - \frac{\mu_B}{\lambda_K}a$$

For simplification, it is assumed that $\nu = 1$, and substituting for λ_H/λ_K from equation (3.4)

$$\Rightarrow \frac{u_{11}(c,\gamma)\dot{c}}{u_1(c,\gamma)} - \rho = \delta - \mathrm{A}\alpha(\frac{\mathrm{H}}{\mathrm{K}})^{1-\alpha}(1-h-\gamma) - \frac{\mathrm{AK}^{\alpha}\mathrm{H}^{1-\alpha}}{\theta\beta h^{\beta-1}\mathrm{K}^{\phi}\mathrm{H}^{1-\phi}}\theta\phi h^{\beta}(\frac{H}{K})^{1-\phi} - \frac{\mu_B}{\lambda_K}a$$

$$\Rightarrow \frac{u_{11}(c,\gamma)\dot{c}}{u_1(c,\gamma)} = (\rho+\delta) - \mathrm{A}(\frac{\mathrm{H}}{\mathrm{K}})^{1-\alpha}(\alpha(1-h-\gamma) + \frac{\phi h}{\beta}) - \frac{\mu_B}{u_1(c,\gamma)}a \qquad ...(4.49)$$

Equation (4.49) describes dynamics of consumption c and also helps in pinning down K* value of physical capital in steady state equilibrium.

Here the value of μ_B is interpreted as gain in additional lifetime utility that would result from able to borrow an extra dollar today, consume its proceeds, and reduce

consumption appropriately next period. Since agents are constrained from borrowing more, but not from saving more, at the constrained optimum, the marginal utility from consuming an extra unit today is always greater than or equal to the marginal utility from waiting until tomorrow to consume the extra amount (Zeldes, 1989).

Then the co- state equation for state variable H is as following:

$$2.-\frac{\partial H_C}{\partial H} = -[(\nu f_2(.,.) + (1-\nu)w_H H + (1-\nu)w)\lambda_K(1-h-\lambda) +$$

$$+ \lambda_H(\theta(1-\phi)h^{\beta}(\frac{K}{H})^{\phi} - d) + \mu_B\psi] = \dot{\lambda}_H - \rho\lambda_H \qquad ...(4.50)$$

Substituting from equation (4.46) for $\frac{\dot{\lambda}_H}{\lambda_H}$, following expression is obtained.

$$\Rightarrow \frac{u_{11}(c,\gamma)\dot{c}}{u_1(c,\gamma)} + (\alpha-\phi)\frac{\dot{K}}{K} + (\phi-\alpha)\frac{\dot{H}}{H} + (1-\beta)\frac{\dot{h}}{h} = \rho - (\theta(1-\phi)h^{\beta}(\frac{K}{H})^{\phi} - d) - \frac{\mu_B\psi}{\lambda_H}$$

$$-\frac{\lambda_K}{\lambda_H}(\nu f_2(.,.) + (1-\nu)w_H H + (1-\nu)w)(1-h-\gamma)$$

Again assuming $\nu = 1$, and substituting for λ_H; equation (3.14) is simplified as following:

$$\frac{u_{11}(c,\gamma)\dot{c}}{u_1(c,\gamma)} + (\alpha-\phi)\frac{\dot{K}}{K} + (\phi-\alpha)\frac{\dot{H}}{H} + (1-\beta)\frac{\dot{h}}{h} = \rho - (\theta(1-\phi)h^{\beta}(\frac{K}{H})^{\phi} - d) -$$

$$-\frac{\mu_B\psi\theta\beta h^{\beta-1}}{Au_1(c,\gamma)}(\frac{K}{H})^{\phi-\alpha} - \frac{\theta\beta h^{\beta-1}}{A}(\frac{K}{H})^{\phi}(1-h-\gamma)(1-\alpha) \qquad ...(4.51)$$

Equation (4.51) describes dynamics of human capital investment rate h and also helps in pinning down H*, value of human capital in steady state equilibrium.

The co- state equation for state variable B is as following:

$$3.-\frac{\partial H_C}{\partial B} = -[-\lambda_K(r + s\sigma B^{\sigma-1}) - \mu_B] = \dot{\lambda}_B - \rho\lambda_B \qquad ...(4.52)$$

Substituting from equation (3.9) for $\frac{\dot{\lambda}_B}{\lambda_B}$, following expression is obtained.

$$\Rightarrow \frac{u_{11}(c,\gamma)\dot{c}}{u_1(c,\gamma)} - (\eta - 1)\frac{\dot{b}}{b} = \rho + \frac{\lambda_K}{\lambda_B}(r + s\sigma B^{\sigma-1}) + \frac{\mu_B}{\lambda_B}$$

Then substituting for λ_K and λ_B (using equations 3.1, and 3.3), this is further simplified to

$$\Rightarrow (\eta - 1)\frac{\dot{b}}{b} = \frac{u_{11}(c,\gamma)\dot{c}}{u_1(c,\gamma)} - \rho + \eta b^{\eta-1}(r + s\sigma B^{\sigma-1}) + \frac{\mu_B \eta b^{\eta-1}}{u_1(c,\gamma)} \qquad ...(4.53)$$

Equation (4.53) describes dynamics of borrowing rate b and also helps in pinning down B*, value of human capital in steady state equilibrium.

4.3.2 Analysis of the above framework

The equations (4.36, 4.39, 4.41, 4.47, 4.49, 4.51, and 4.53) and laws of motion describing dynamics of K, H, and B with initial conditions, constraints and transversality conditions, form a system of equations – that determine the dynamics of control, state, and co-state variables and also their values in steady state equilibrium. We are mainly interested in understanding the effects of borrowing constraint on steady state values of consumption c*, human capital investment h*, borrowing rate b*, leisure γ*, physical capital K*, human capital H*, and debt B*, and also on the dynamics of these variables. As this system is described by large number of variables, it is analytically tractable to characterize the dynamics and steady state expressions of these variables rather than trying to obtain close form solutions.

4.3.2.1 Dynamics of consumption 'c'

Movement of c over time (until its steady state) is described by equation (4.49) , which is reproduced as following.

$$\frac{u_{11}(c,\gamma)\dot{c}}{u_1(c,\gamma)} = (\rho + \delta) - \mathrm{A}(\frac{\mathrm{H}}{\mathrm{K}})^{1-\alpha}(\alpha(1 - h - \gamma) + \frac{\phi h}{\beta}) - \frac{\mu_B}{u_1(c,\gamma)}a \qquad ...(4.49)$$

$$\Rightarrow \dot{c} = \frac{u_1(c,\gamma)}{u_{11}(c,\gamma)}[(\rho+\delta) - \mathrm{A}(\frac{\mathrm{K}}{\mathrm{H}})^{\alpha-1}(\alpha(1-h-\gamma)+\frac{\phi h}{\beta}) - \frac{\mu_B}{u_1(c,\gamma)}a\,] \qquad ...(4.54)$$

Since $u_1(c,\gamma) > 0;\ u_{11}(c,\gamma) < 0;$ and $\mu_B > 0$: when borrowing constraint binds.

Hence, $\dot{c} > 0;$ when borrowing constraint binds.

Also for simple case when it is assumed that η =1 (linear growth of debt), and s = 0 (no set up cost of debt), then equations (4.37, 4.38, and 4.53) imply

$$u_1(.,.) = \lambda_K \qquad ...(4.37)$$

$$\lambda_{\mathrm{K}} + \lambda_B = 0 \quad \text{(assuming } \mu_T = 0) \qquad ..(4.38)$$

$$\frac{u_{11}(c,\gamma)\dot{c}}{u_1(c,\gamma)} = \rho - r - \frac{\mu_B}{u_1(c,\gamma)} \qquad ...(4.53)$$

$$\Rightarrow \dot{c} = \frac{u_1(c,\gamma)}{u_{11}(c,\gamma)}(\rho - r - \frac{\mu_B}{u_1(c,\gamma)}) \qquad ...(4.55)$$

$\Rightarrow \dot{c} > 0,$ when r > ρ; $\mu_B > 0$

The above analysis is summarized in following result.

Result 4.9: When a person is borrowing constrained, his optimal consumption path is not smoothened across time, even when the discount factor and interest rate are same. It induces increasing consumption path. This suggests that the person may not be able to get her subsistence level of consumption in initial periods and she has to postpone the consumption – and because of concavity assumptions on the utility function, it may lead to overall loss of her welfare.

4.3.2.2 Value of K* (in Steady State Equilibrium): Using equation (4.49, and 4.54) which assumes that the agent optimally chooses entrepreneurship: v=1. In steady state $\dot{c}$=0. Hence

$$\Rightarrow \dot{c} = 0 = \frac{u_1(c,\gamma)}{u_{11}(c,\gamma)}[(\rho+\delta) - \mathrm{A}(\frac{\mathrm{K}}{\mathrm{H}})^{\alpha-1}(\alpha(1-h-\gamma)+\frac{\phi h}{\beta}) - \frac{\mu_B}{u_1(c,\gamma)}a\,] \qquad ...(4.54)$$

$$\Rightarrow \mathrm{A}(\frac{\mathrm{K}}{\mathrm{H}})^{\alpha-1}(\alpha(1-h-\gamma)+\frac{\phi h}{\beta}) = (\rho+\delta) - \frac{\mu_B}{u_1(c,\gamma)}a$$

$$\Rightarrow \mathrm{K}^* = H^*(\frac{A(\alpha(1-h^*-\gamma^*)+\frac{\phi h^*}{\beta})}{(\rho+\delta)-\frac{\mu_B}{u_1(c^*,\gamma^*)}a})^{1/(1-\alpha)} \qquad ...(4.55)$$

Also equation (4.55) suggests that in steady state, both K*, and H* are complementary to each other.

Now $\mu_B > 0$ and $\mathrm{B} \le \mathrm{aK} + \psi\mathrm{H}$ $(\mathrm{a}, \psi > 0)$, hence increasing values of 'a' relaxes the borrowing constraint. This leads to higher value of K* in steady state with reduced borrowing constraint.

$$\Rightarrow \frac{\partial \mathrm{K}^*}{\partial \mathrm{a}} > 0 \qquad ...(4.56)$$

Higher H* promotes higher value of K* and vice versa. The above observations are summarized in the following result.

Result 4.10: In the steady state, value of physical capital and human capital are complimentary to each other. Higher value of human capital promotes higher value of physical capital and vice versa. Also, with relaxation of borrowing constraints, the steady state value of physical capital increases.

Survey Findings: Household assets are observed to be positively correlated (correlation coefficients are .12 and .10 respectively for China and India) with educational attainments of the respondents.

4.3.2.3. Value of H*and h* (in Steady State Equilibrium): Using equation (4.51), value of H* can be obtained and then using state equation of H, value of h* is obtained.

$$\rho - (\theta(1-\phi)h^{\beta}(\frac{K}{H})^{\phi} - d) - \frac{\mu_B \psi \theta \beta h^{\beta-1}}{\mathrm{Au}_1(c,\gamma)}(\frac{K}{H})^{\phi-\alpha} - \frac{\theta\beta h^{\beta-1}}{A}(\frac{K}{H})^{\phi}(1-h-\gamma)(1-\alpha) = 0$$

$$\Rightarrow (\frac{K}{H})^{\phi}[\,\theta(1-\phi)h^{\beta} + \frac{\theta\beta h^{\beta-1}}{A}(1-h-\gamma)(1-\alpha)\,] + \frac{\mu_B \psi \theta \beta h^{\beta-1}}{\mathrm{Au}_1(c,\gamma)}(\frac{K}{H})^{\phi-\alpha} = \rho + \mathrm{d} \quad ..(4.57)$$

Now it is further assumed that $\phi = \alpha$, then

$$\mathrm{H}^* = K^* \left(\frac{\theta(1-\phi)h^{\beta} + \frac{\theta\beta h^{\beta-1}}{A}(1-h-\gamma)(1-\alpha)}{\rho + \mathrm{d} - \frac{\mu_B \psi \theta \beta h^{\beta-1}}{\mathrm{Au}_1(c,\gamma)}}\right)^{1/\phi} \qquad ...(4.58)$$

Equation (4.58) suggests that as the borrowing constraint is relaxed more (ψ increases) H^* increases: $\frac{\partial \mathrm{H}^*}{\partial \psi} \geq 0.$

Ideally in steady state, if there is no depreciation of human capital, then h* should be zero. But when there is depreciation of H involved, then h* should be that much – which is able to replete the depreciated part. Hence

$$\theta h^{\beta} * K^{*\phi} H^{*1-\phi} - dH^* = 0 \;\Rightarrow \mathrm{h}^{\beta}* = \frac{\mathrm{dH}^{*\phi}}{\theta K^{*\phi}} \qquad ...(4.59)$$

Also the comparative statics is characterized as following

$\frac{\partial h^*}{\partial H^*} \geq 0$; and earlier it is shown that $\frac{\partial H^*}{\partial \psi^*} > 0$; hence by chain rule, $\frac{\partial h^*}{\partial \psi^*} \geq 0.$

Hence human capital investment rate and its aggregate value increases with relaxation of borrowing constraint.

For the reasons explained above, understanding the optimal value of 'h' across time is more important rather than examining the value of h* in steady state. This may throw light on the facts that on the life cycle path how h should optimally be invested. For this consider the equation (4.39)

$$\frac{\partial H_C}{\partial h} = 0 \Rightarrow \lambda_K(\nu f(K,H) + (1-\nu)wH) = \lambda_H \theta\beta h^{\beta-1} K^{\phi} H^{1-\phi} \quad ...(4.39)$$

Let, $\nu = 1$ (job choice is entrepreneurship).

$$\Rightarrow \lambda_K A K^{\alpha} H^{1-\alpha} = \lambda_H \theta\beta h^{\beta-1} K^{\phi} H^{1-\phi} \quad \Rightarrow h^{1-\beta} = \frac{\lambda_H \theta\beta}{\lambda_K A}(\frac{H}{K})^{\alpha-\phi} \quad ...(4.60)$$

Important ramipifications of equation (4.60) are as following:

When shadow value of human capital investment λ_H is bigger than that of physical capital λ_K then h increases. It may be reasonable to assume that, in the beginning of the life cycle path, λ_H may dominate and later the physcial capital part may dominate - and so in the beginning of the path, 'h' should be maximum and then it should gradually decline to its steady state value. But then in the beginning less of time is left for earning the livelihood.

When there is no constraint on borrowing, this prescription is not problematic. One can borrow in the beginning to make desired level of human capital investement. It will further augument the earning potential. But when the persion is credit constrained, then suboptimal 'h' is obtained, which further restricts the earning potential.

But in presence of borrowing constraint λ_K is decreasing (equation 4.44) – implying that initially it may be dominating over λ_H and hence maximum value of 'h' is not obtained in beginning of life cycle.

Equation (4.60) suggests that higher value of λ_H, θ, and β leads to higher value of 'h'. Now let us examine the equation (4.51)

$$\Rightarrow \frac{u_{11}(c,\gamma)\dot{c}}{u_1(c,\gamma)} + (\alpha-\phi)\frac{\dot{K}}{K} + (\phi-\alpha)\frac{\dot{H}}{H} + (1-\beta)\frac{\dot{h}}{h} = \rho - (\theta(1-\phi)h^{\beta}(\frac{K}{H})^{\phi} - d) -$$

$$\frac{\mu_B \psi \nu \theta\beta h^{\beta-1}}{Au_1(c,\gamma)}(\frac{K}{H})^{\phi-\alpha} - \frac{\theta\beta h^{\beta-1}}{A}(\frac{K}{H})^{\phi}(1-h-\gamma)(1-\alpha) \quad ...(4.51)$$

Two important implications of equation (4.51) are as following:

1. In equation (4.51), more the borrowing constraint is relaxed (ψ increases), $\dot{h}$ becomes more negative, implying that it declines faster to its steady state value. For that in the beginning of the life cycle, h should be higher. Hence relaxing of borrowing constraints induces higher value of 'h' in the beginning of life cycle.

2. If K and H are increasing at same rate towards its steady state value along optimal path, then in presence of borrowing constraint 'h' is also increasing (as dynamic terms of K and H cancel each other and then 'h' follows same trend as that of 'c'). This shows that optimally maximum 'h' is not attained in the beginning of life cycle.

Dynamics of λ_K is described by equation (4.44)

$$\Rightarrow u_{11}(c,\gamma)\dot{c} = \dot{\lambda}_K \qquad ...(4.44)$$

In presence of borrowing constraint 'c' is increasing, hence λ_K is decreasing.
Dynamics of λ_H is described by equation (4.46) as following.

$$\frac{\dot{\lambda}_H}{\lambda_H} = \frac{u_{11}(c,\gamma)\dot{c}}{u_1(c,\gamma)} + (\alpha - \phi)\frac{\dot{K}}{K} + (\phi - \alpha)\frac{\dot{H}}{H} + (1-\beta)\frac{\dot{h}}{h} \qquad ...(4.46)$$

In presence of borrowing constraint, first term on the right hand side is negative, the second and third terms may cancel each other and last term is positive, then λ_H may be increasing over time if last term dominates, otherwise it may be decreasing.

The above observations are summarized in the following result:

Result 4.11: Relaxation of borrowing constraint, helps increase the value of human capital (H*) and also its investment rate (h*) in steady state. Optimally human capital investment rate should be maximum (higher h_{opt}) in the beginning of the life cycle and may decline to its steady state value in the later part of life cycle. If an agent is constrained in borrowing, then she can not possibly devote h_{opt} for schooling and then Relaxation of borrowing constraint facilitates in achieving this optimality.

4.3.2.4. Value of B*and b* (in Steady State Equilibrium)

Equation (4.53) pins down the steady state value of B*, and then using state equation of B, value of b* is obtained in steady state equilibrium.

$$\Rightarrow (\eta-1)\frac{\dot{b}}{b} = \frac{u_{11}(c,\gamma)\dot{c}}{u_1(c,\gamma)} - \rho + \eta b^{\eta-1}(r + s\sigma B^{\sigma-1}) + \frac{\mu_B \eta b^{\eta-1}}{u_1(c,\gamma)} \qquad ...(4.53)$$

In steady state equilibrium, following expression for B is obtained.

$$\Rightarrow \rho = \eta b^{\eta-1}(r + s\sigma B^{\sigma-1}) + \frac{\mu_B \eta b^{\eta-1}}{u_1(c,\gamma)}$$

Now for simplification , let us assume that $\eta = 1$

$$\Rightarrow B^* = \left(\frac{(\rho - r) - \mu_B / u_1(c,\gamma)}{s\sigma}\right)^{1/(\sigma-1)} \qquad ....(4.61)$$

Hence when $\sigma > 1$, then B^* increases, with higher values of discount rate , lower values of interest rate and lower values of set up cost of the loan. However B^* decreases in presence of borrowing constraint , as $\mu_B > 0$.

These findings are summarized in the following result.

Result 4.12: The optimal value of debt in the steady state is an increasing function of discount rate, and decreasing function of interest rate, and set-up cost of debt. The borrowing constraint reduces the optimal value of debt in steady state.

The survey results reveal that more than 85 percent respondents in both the countries agree that they would be willing to borrow more if interest rates and other costs of debts are reduced.

Equation (4.53) also describes the dynamics of borrowing rate b. In presence of borrowing constraint consumption increases over time, hence first term on the right hand side of the equation is negative, also second term is negative. However third term and last term are positive. Equation (4.53) is transformed to describe dynamics of b

and presented in equation (4.62). If last two terms jointly dominate the first two terms then borrowing increases over time, otherwise it decreases over time.

$$\Rightarrow (\eta-1)\dot{b} = b(\frac{u_{11}(c,\gamma)\dot{c}}{u_1(c,\gamma)} - \rho) + (\eta b^{\eta}(r + s\sigma B^{\sigma-1}) + \frac{\mu_B \eta b^{\eta}}{u_1(c,\gamma)}) \quad ...(4.62)$$

If there is no borrowing constraint, maximum borrowing is done in the beginning for investment in physical and human capital and after that it will be decreasing over time to its steady state value of zero. In presence of borrowing constraint, such optimality is not attained. Now for, $0 \le t \le T_1$ (T_1 is such that the last two terms dominate) rate of borrowing is positive and increases steadily. After that the first two terms dominate and then borrowing starts declining until in steady state it becomes zero.

4.3.2.5 Dynamics of Leisure (γ)

Equation (3.11) describes the dynamics of leisure, which is reproduced below. In presence of borrowing constraint, the first term on the right hand side of the equation is negative and the last two terms are positive. Hence leisure is increasing over time if the first term dominates otherwise it decreases over time.

$$\frac{u_{22}(c,\gamma)\dot{\gamma}}{u_2(c,\gamma)} = \frac{u_{11}(c,\gamma)\dot{c}}{u_1(c,\gamma)} + (\alpha)\frac{\dot{K}}{K} + (1-\alpha)\frac{\dot{H}}{H} \quad ...(4.47)$$

Also steady state equilibrium value of leisure is guided by equation (4.41) which is reproduced below. Assuming ν =1

$$u_2(c^*,\gamma^*) = u_1(c^*,\gamma^*)AK^{*\alpha} H^{*1-\alpha} \quad ...(4.41)$$

$\Rightarrow \gamma^*$ increases with c^* and reduces with higher value of K^* and H^*.

These findings lead to result 4.13.

Result 4.13: In presence of borrowing constraint leisure increases or decreases over time depending on whether consumption term dominates the trajectory of capital (physical and human) term. Also steady state equilibrium value of leisure increases with higher value of consumption and decreases with higher values of physical or human capital amount.

4.3.3 Borrowing Constraints, Capital Formation and Consumption

The general set up proposed in section 3.2 helps in understanding the impact of borrowing constraint on the trajectory of relevant control and state variables and also its effect on their steady state values. However large numbers of variables make it difficult to obtain explicit expressions related to dynamics and steady state values of the state and control variables. Now to illustrate the earlier description, a simpler model is being presented in this sub section, involving choices of only borrowing, capital (physical and human combined) investment, and consumption. The description of model is as following:

K_t = Amount of capital at time t.

B_t = Capital investment (financed by borrowing) made at time t.

$K_{t+1} - K_t = B_t - dK_t \quad ; \quad 0 < d < 1;$ ...(4.63)

c_t = Amount of consumption = $f(K_t) - (1+r)B_t - sB_t^2$; ...(4.64)

where, r = interest rate, s = factor realted to set up cost of debt; $r > 0$; $s > 0$;

Where, $f(K_t)$ is a well behaved production function ...(4.65)

Again infinite time horizon optimization set up is considered. The borrower borrows money every period to invest it for production purposes. Outputs obtained from production are used for consumption, loan repayment and also to pay for set up cost of

debt. The relevant optimization problem which optimizes amount of borrowing every period is described as following.

$$\max_{B_t} \sum_{t=0}^{t=\infty} \rho^t u(c_t)$$

subject to $K_{t+1} - K_t = B_t - dK_t$ ...(P2)

c_t = Amount of consumption = $f(K_t) - (1+r)B_t - sB_t^2$

and $B \le B_{max}$: Borrowing constraint : λ_t is constraint coefficient

$K_{t=0} = K_0$; $\lim_{T\to\infty} K_T V'(K_T) = 0$: K_T = State Variable at time T.

This optimization program will be solved using dynamic programming method.

Let $V(K_t)$ be the value function of this optimization program at any time t. The Bellman equation is :

$$V(K_t) \equiv \max_{B_t}\{u(c_t) + \rho V(K_{t+1})\} + \lambda_t(B_{max} - B)$$

$$\Rightarrow V(K_t) \equiv \max_{B_t}\{u(f(K_t) - (1+r)B_t - sB_t^2) + \rho V(K_{t+1})\} + \lambda_t(B_{max} - B_t) \quad ...(4.66)$$

$$\Rightarrow V(K_t) \equiv \max_{B_t}\{u(f(K_t) - (1+r)B_t - sB_t^2) + \rho V(B_t + (1-d)K_t)\} + \lambda_t(B_{max} - B_t)$$

The first order necessary and sufficient (as V(.) is concave) condition implies

$$\Rightarrow \frac{\partial V(K_t)}{\partial B_t} = -u'(c_t)((1+r) + 2sB_t) + \rho V'(K_{t+1})1 - \lambda_t = 0$$

Also $\lambda_t(B_{max} - B_t) = 0$; λ_t : $\begin{cases} \lambda_t = 0 & \text{: in case of unconstrained borrowing} \\ \lambda_t > 0 & \text{: in case of credit rationing} \end{cases}$

$$\Rightarrow u'(c_t)((1+r) + 2sB_t^*) = \rho V'(K_{t+1}) - \lambda_t \quad ...(4.67)$$

The Envelope Theorem implies

$$\Rightarrow V'(K_t) = u'(c_t)(f'(K_t)) + \rho V'(K_{t+1})(1-d) \quad ...(4.68)$$

In the steady state, $K_{t+1} = K_t = K$

$$\Rightarrow \rho V'(K)(-1+d+1/\rho) = u'(c_t)f'(K)$$

$$\Rightarrow V'(K) = \frac{u'(c\ )f'(K)}{(1+\rho(d-1))} \qquad ...(4.69)$$

Integrating equation (4.69) and using boundary conditions expression for value function can be obtained. However, first optimal feedback policy, $B_t^* = \psi(K_t)$, determined by equation (4.67) is obtained as following

$$\Rightarrow B_t^* = \frac{1}{2s}\left(\frac{\rho V'(K_{t+1}) - \lambda_t}{u'(c_t)} - (1+r)\right) \qquad ...(4.70)$$

Using equation (4.69) , following expression is obtained

$$\Rightarrow B_t^* = \frac{1}{2s}\left(\frac{\rho}{u'(c_t)} \frac{u'(c_{t+1})f'(K_{t+1}) - \lambda_t}{(1+\rho(d-1))} - (1+r)\right)$$

$$\Rightarrow B_t^* = \frac{1}{2s}\left(\frac{\rho u'(c_{t+1})}{u'(c_t)} \frac{f'(B_t^* + K_t(1-d)) - \lambda_t}{(1+\rho(d-1))} - (1+r)\ \right) \qquad ...(4.71)$$

Equation (4.71) determines the optimal feedback policy, $B_t^* = \psi(K_t)$

Once the feedback policy is determined, the optimal trajectory of K_{t+1} is iteratively worked out as described following.

$$K_{t+1} = B_t^* + (1-d)K_t$$

Replacing $B_t^* = \psi(K_t)$ from equation (4.71), iterative equation of K_{t+1} is obtained

$$K_{t+1} = \psi(K_t) + (1-d)K_t \qquad ...(4.72)$$

Because of our assumptions of concavity on utility function and production function equation (4.72) guarantees convergence of K_{t+1} to its steady state value K^*.

Steady state value of K* is computed using equation (4.71) and (4.63) and using the fact that in steady state, $c_t = c^*$ and $K_t = K^*$ for all t

$$\Rightarrow B_t^* = \frac{1}{2s}\left(\frac{\rho}{u'(c_t)}\frac{u'(c_{t+1})f'(K_{t+1}) - \lambda_t}{(1+\rho(d-1))} - (1+r)\right) \quad ...(4.71)$$

$$\text{In steady state, } \Rightarrow dK^* = \frac{1}{2s}\left(\frac{\rho}{}\frac{f'(K^*) - \lambda_t / u'(c^*)}{(1+\rho(d-1))} - (1+r)\right) \quad ...(4.73)$$

For illuatration and ease of computation, let us assume that

$f(K) = aK - bK^2$; $a > 0, b > 0$ such that $f(K)$ is positive and concave

$$\Rightarrow dK^* = \frac{1}{2s}\left(\frac{\rho}{}\frac{a - 2bK^* - \lambda_t / u'(c^*)}{(1+\rho(d-1))} - (1+r)\right)$$

$$K^*(2sd(1+\rho(d-1)) + 2\rho b) = \rho a - (1+r)(1+\rho(d-1)) - \rho\lambda/u'(c^*)$$

$$\Rightarrow K^* = \frac{\rho a - (1+r)(1+\rho(d-1)) - \rho\lambda/u'(c^*)}{(2sd(1+\rho(d-1)) + 2\rho b)} \quad \text{and } B^* = dK^* \quad ...(4.74)$$

Equation (4.74) shows that credit constraints lead to lower steady state value of capital. Further simple close form expression of optimal feedback policy is obtained if it is assumed that the agent is risk neutral – hence the preferences are represented by linear utility function, i.e. u(c) =c. Then equation (4.71) yields following expression.

$$\Rightarrow B_t^* = \frac{1}{2s}\left(\frac{\rho u'(c_{t+1})}{u'(c_t)}\frac{f'(K_{t+1}) - \lambda/u'(c_{t+1})}{(1+\rho(d-1))} - (1+r)\right) \quad ...(4.71)$$

$$\Rightarrow B_t^* = \frac{1}{2s}\left(\frac{\rho}{}\frac{a - 2bK_{t+1} - \lambda}{(1+\rho(d-1))} - (1+r)\right)$$

$$\Rightarrow B_t^* = \frac{1}{2s}\left(\frac{\rho}{}\frac{a - 2b(B_t^* + (1-d)K_t) - \lambda}{(1+\rho(d-1))} - (1+r)\right)$$

$$\Rightarrow B_t^*(2s(1+\rho(d-1)) + 2\rho b) = \rho a - (1+r)(1+\rho(d-1)) - 2b(1-d)K_t - \rho\lambda_t$$

$$\Rightarrow B_t^* = \frac{\rho a - (1+r)(1+\rho(d-1)) - 2b(1-d)K_t - \rho\lambda_t}{(2s(1+\rho(d-1)) + 2\rho b)} = \psi(K_t) \quad ...(4.75)$$

Essentially the optimization program is characterized by following equations:

1. The feedback policy function; $B_t^* = \psi(K_t)$, which describes optimal borrowing trajectory

$$B_t^* = \frac{1}{2s}\left(\frac{\rho u'(c_{t+1})}{u'(c_t)}\frac{f'(B_t^* + K_t(1-d)) - \lambda_t}{(1+\rho(d-1))} - (1+r)\right) \quad ...(4.71)$$

For a linear utility function and a quadratic concave production function, equation (4.71) is simplified to equation (4.76)

$$B_t^* = \frac{\rho a - (1+r)(1+\rho(d-1)) - 2b(1-d)K_t - \rho\lambda_t}{(2s(1+\rho(d-1)) + 2\rho b)} = \psi(K_t) \quad ...(4.76)$$

2. The optimal trajectory of state variable in next period, or state equation

$$K_{t+1} = (B_t^* = \psi(K_t)) + (1-d)K_t \quad ...(4.72)$$

3. Steady state equilibrium values of borrowing (B*) and Capital (K*)

$$K^* = \frac{\rho a - (1+r)(1+\rho(d-1)) - \rho\lambda}{(2sd(1+\rho(d-1)) + 2\rho b)} \quad \text{and} \quad B^* = dK^* \quad ...(4.74)$$

4. Steady State value of Value Function

$$V(K^*) = u(c^*) + \rho V(K^*) + \{\lambda(B_{max} - B) = 0\}$$

$$\Rightarrow V(K^*) = \frac{u(c^*)}{1-\rho}; \text{ where, } c^* = f(K^*) - (1+r)B^* - sB^{*2} \quad ...(4.77)$$

Equation (4.76) describes the optimal borrowing amount in every year. However if the borrower can not borrow beyond a certain amount, say $B_t \leq B_{max}$ then the optimal trajectory of capital formation, and utility attainment is disrupted and it takes longer duration to achieve the lower level of steady state equilibrium, that clearly demonstrates welfare loss as value of the value function (equation 4.77) is reduced. These findings are summarized in result 4.14.

Result 4.14: Borrowing constraint reduces the steady state equilibrium values of capital and borrowing rate, which in turn adversely affects consumption in steady state. Also in presence of borrowing constraint it takes longer duration to attain steady state. As a result the borrower incurs welfare loss.

A simple example demonstrates above observations, using following parametric values:

$a = 500,\ \ b = 1.5, s = 75,\ d = 0.02,\ \rho = 0.96,\ K_0 = 0.0$

$\Rightarrow K^* = 151.15,\ B^* = 3.14$; in case of unconstrained borrowing

The trajectories of capital formation for different levels of credit rationing have been shown in Figure 4.2. Clearly the steady state values of capital decreases with stricter level of credit rationing and also it takes additional numbers of years to attain steady state values, when borrowing is not unconstrained; Table 4.2 summarizes that.

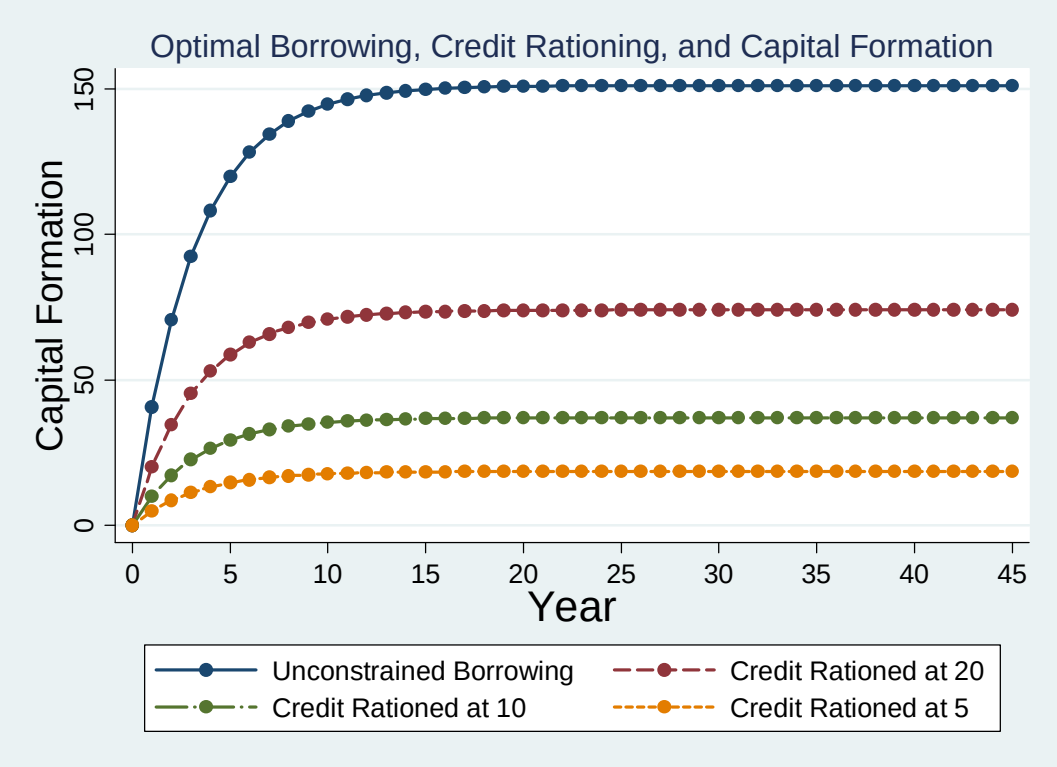

Figure 4.2: Capital Formation under Various Credit Rationing Regimes

Table 4.2: Numbers of years Needed to Attain Steady State Equilibrium

Sl. Number	Credit Rationed at B_{max}	Value of Constraint Coefficient	Steady State Value of Capital	Value Function	Number of Years Needed to attain Steady State Equilibrium
1	Unconstrained	$\rho\lambda = 0$	151.15	1015421	20
2	B_{max} =20	$\rho\lambda = 244.75$	74.1	716018	28
3	B_{max} =10	$\rho\lambda = 362.33$	37.04	410488	34
4	B_{max} =5	$\rho\lambda = 421.12$	18.52	218406	40

4.4. Empirical Investigations

Some of the survey questions specifically elicited information from the respondents on various types of problems they confront because of credit constraints, such as, food insecurity, less input application in farming, inadequate education and health care attainments etc. Table 3 enumerates the percentages of families across the quintiles of assets for both countries, who stated that they were compelled to use lower level of inputs ("Low input") for farming, who do not get adequate amount of food ("Less food"), and who are not able to provide desired level of health care and education ("Less education"), because of credit constraints. It is generally decreasing with higher level of quintiles. Apparently people having fewer assets are more credit constrained and hence compelled to use suboptimal level of inputs.

Table 4.3: Effects of Credit Constraints on Various Livelihood Choices (Percentage)

	China (N= 743)			India (N=400)		
Asset Quintile	Low input	Less food	Less education	Low input	Less food	Less education
1	80	22	64	78	65	67
2	77	31	58	90	63	73
3	75	20	45	81	50	64
4	66	21	49	81	43	51
5	71	16	37	61	38	43
Total	74	21	50	78	52	60

The purpose of this section to develop an appropriate econometric model to investigate the nature of associations (or causality) between credit constraints and above said variables. For tractability of analysis a composite binary variable "Credit impact" is created as following;

Credit impact =1, when food insecurity =1 or less education =1 or less inputs =1;

Otherwise, Credit impact = 0.

Similarly another composite binary variable "Credit impact1" is created with "and" conditions in place of "or" conditions. The summary statistics of these variables for both the countries, India and China are reported in Table 4.4.

Table 4.4: Mean Values of Credit impact and Credit Impact1 (binary variables)

Country	N	Credit impact	Credit impact1
India	399	0.81	0.44
China	741	0.85	0.14

4.4.1 Econometric Model and Identification Strategy

The a-priori hypothesis is that in presence of credit constraints, it may be difficult to afford the cost of optimal level of some of the livelihood choices such as, food consumption, farm inputs, and health and educational attainments. Also the propensity to use these choices may be negatively affected. Credit constraints can thus have causal effects on these choices, which have been analyzed in sections 2 and 3.

To infer causality, we need data with natural experiments or ideally randomized experiments. But it is difficult, expensive and time consuming to get access to such data sets. Hence this chapter attempts to investigate underlying nature of associations of credit constraints and "Credit impact". However using suitable econometric methods (discussed later) we can still infer causality.

We are primarily interested in the coefficient on the variable related to credit constrainedness. However, as discussed earlier the binary variable "Credit Constraint" is not an exogenous variable, rather it can be explained by several covariates – hence first an estimation equation has been specified for "Credit Constraint", and then the predicted values of "Credit Constraint" have been used in the ensuing regressions. Probit regression method is used to estimate the equations related with impact of credit constraint.

Hence the following system of equations needs to be estimated

$$C = \beta' \mathrm{X1} + \gamma B + \varepsilon\,;\ \text{Let } \mathrm{X} = \{\mathrm{X1}, \mathrm{B}\}\,;\ (\varepsilon \mid X) \sim N(0, \sigma_1^{\,2}) \qquad \text{...(4.78)}$$

$$\mathrm{B} = \alpha' \mathrm{X2} + \mathrm{u} \quad ; \quad (\mathrm{u} \mid \mathrm{X2}) \sim \mathrm{N}(0, \sigma_2^{\,2}) \qquad \text{...(4.79)}$$

$$\text{Where, B} = \text{Credit constraint, and } (\varepsilon, \mathrm{u} \mid \mathrm{X}, \mathrm{X2}) \approx \text{bivariate Normally distributed.}$$

Here C is "Credit impact" variable, B is "Credit Constraint" (binary) variable. X1 is a set of control variables such as age, sex, socio-economic variables etc. X2 is another set of control variables – it includes X1 variables and also additional variables (instruments) in order to satisfy exclusion criteria for identification of the coefficients. The main coefficient of the interest is γ.

For consistent estimations of {β,γ} , it is necessary that E(X'ε) =0. This requires that the explanatory variables are exogenous i.e. not correlated with the error term.

This assumption gets substantially violated; (i) when any of the explanatory variables is not strictly exogenous and is determined by other explanatory variables and some of the unobservables correlated with the error term, (ii) when any of the explanatory variables is affected by the explained variable because of simultaneity, and (iii) when we are not able to measure any of the explanatory variables appropriately and then use a poor proxy variable or it is measured with systematic errors.

We can justify the orthogonality and adequate identification of most of the control variables, but that of B is evidently suspected here.

Usually a household or individual is identified as borrowing constrained only if she has a positive demand for credit and she is not able to get desired amount of credit. So in the data set the following categories of people are termed as borrowing constrained:

i. People who are apprehensive to enter the credit market - they think that they will be refused.
ii. People who apply for a loan and get refused by the lender.
iii. People who apply for a loan and get a loan amount, but less than the requested amount.

If a person belongs to any of these categories then she is assumed to be borrowing constrained and "Credit Constraint" is specified as a binary variable (1 or 0). In the data the first two categories are explicitly identified. The third category is not directly identified. If it is ignored then the level of borrowing constrainedness in the sample is understated. However if we use econometric methods to estimate the desired amount of credit implicitly then it is open to subjective evaluation.

The binary variable specification of the "Credit Constraint (B)" is problematic mainly because of two reasons – (i) the credit constrainedness is an outcome of several decisions of the demanders and suppliers of the credit. The borrowing constrainedness of a person can be explained by several covariates such as her educational and occupational status, income and wealth level, health status, other observable and non observable factors such as neighborhoods, social status, and government policies related to credit access etc. So the orthogonality of B is not guaranteed; and (ii) it does not measure the propensity (or level) of borrowing constrainedness of a person. Realistically every person depending upon her socio- economic and other conditions may be credit constrained to some extent. In a scale of zero to one – zero means not

credit constrained at all and one means fully credit constrained and any in between value implies partial credit constrained.

Ideally the above system of equations should be estimated using Full Information Maximum Likelihood method which is most efficient. However it is found to be complicated to implement. So the next best alternative is to use Limited Information Maximum Likelihood Method. This however still requires a sound modeling of correlations of errors of the two equations – which is realistically difficult. Hence to make the things simpler, the correlation of the errors of the two equations is ignored. It may affect efficiency of the estimations. In the present set up this assumption is reasonable, as Credit impact variable is not likely to affect credit constraint variable, B. For ease of computations this approximation may not be bad. The degree of correlations of errors of two equations can be measured to check the validity of this simplification. With these simplifications, two stage least square (2SLS) method is used. We are losing some efficiency here, but that eases the computations[25].

Hence in the first stage the second equation related to the Credit Constraint is estimated. The set of instruments in this regression satisfy the exclusion criteria. Then in the second stage, in place of credit constraint, the predicted values of credit constraint from first stage are used in the first equation.

Thus for consistent estimation following specification is estimated.

$$C = \beta' X1 + \pi(\text{Predicted value of Credit constraint} = PBC) + \varepsilon \qquad ...(4.80)$$

$$\text{Let } X = \{X1, PBC\};\ (\varepsilon \mid X1, PBC) \approx N(0, \sigma^2).\ \text{and now } E(X'\varepsilon) = 0.$$

This strategy leads to consistent estimation of the coefficients (β, π).

4.4.1. A Major Hypothesis: The major hypotheses related to the analytical model in section 3 and the econometric models described in this section is as following.

[25] For detail discussion on this; see Greene (2003) – chapters 14, and 15.

Hypothesis 1: The Null is that the increasing level of credit constrainedness is not associated with the "Credit impact" variable, and the alternative is that these are positively associated.

Also we can claim causality here based on selection on observables principle, using the relevant instruments in the first stage that may allow us to measure the effect of exogenous variation of borrowing constraint on "Credit impact" variable.

The summary statistics of important control variables are presented in Table 4.5, and description of credit related outcomes are reported in Table 4.6. The summary statistics of excluded variables / instruments used in the first stage regression are reported in Table 4.7.

Table 4.5: Summary statistic of important variables

Variable	China			India		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Farm Size(mu /acre)	1556	5.47	3.99	400	2.98	2.40
Household income[a]	1555	11462.7	12176.89	400	45577.25	37631.05
Asset Value[a]	1419	52286.8	54910.84	400	408352.5	600320.7
Income source (1=farm)	1419	.42	.49	400	.77	.41
Education (1-4)[b]	754	2.40	.78	400	2.54	.82
Sex (1=female)	756	.10	.30	400	.003	(.05)
Age (Years)	754	40-50	10	400	47.5	11.5
Household Size	1155	4.4	1.55	400	6.6	3.5
amount of debt[a]	1020	13336.8	26585.34	337	15671.96	21400.19

a. Units are local currency (RMB in China / Rupees in India). b. Education: 1- No schooling, 2 – Primary schooling, 3- Secondary schooling, 4 – College and above.

Table 4.6: Description of Borrowing Behavior and Credit Constraint

Variable (binary variables) : Values reported in percentage	China		India	
	Mean	Observations	Mean	Observations
Loan application rejected	.31	1010	.41	399
Could not get adequate loan for various purposes	.30	756	.45	384
Never get desired amount of loan	.38	1320	.62	400
Sometimes got desired amount of loan	.30	1320	.30	400
Always got desired amount of loan	.32	1320	.07	400
Credit Rationed (1,0)	.58	1418	.66	400

It appears that borrowing opportunities are limited in both countries.

A household belonging to any of the following categories has been assigned as credit rationed – (i) Loan application rejected, (ii) Could not get adequate credit various purposes (consumption, education, health, farming or business), and (iii) Never obtained desired amount of credit.

Table 4.7: Summary Statistics of excluded variables/ instruments

Variable (1=yes)	Mean (s.d.) : China (N=756)	Mean (s.d.) : India (N=384)
Lacks collateral	.53 (.50)	.47 (.50)
Denied loan because of collateral	.64 (.47) : N=525	.50 (50) : N=175
Apprehensions because of unpaid debts	.51 (.50)	.46 (.50)
Apprehensions because of high interest rates	.68 (.46)	.34 (.47)
Apprehensions because of delay and bribe	.45 (.50)	.93 (.24)

4.4.2 Estimation Model for Credit Constraints

As generally agreed the positive demand for credit by a person is an outcome of her decision process that is influenced by several covariates such as; age, sex, income, wealth endowments, educational level, occupational status, health status and so on. Similarly the lending decisions of a lender are influenced by several variables such as; income of the borrower, bankability of the project, etc. And so also the desired amount of credit of a borrower is influenced by several covariates. These three decision processes can be estimated using full information maximum likelihood (FIML) method following Heckman selection procedure or Heckman two step procedure. However another simpler approach is followed here as described below.

Let us assume that the amount of desired debt of any person is D*, and also assume that amount of available loan to him is S*. Then the person is assumed to be borrowing constrained iff; $D^* > S^*$. This excess demand for credit is, $Z^* = D^* - S^*$.

The latent variable formulation of D^* and S^* can be made as following:

$D^* = \eta' X_D + \varepsilon_D$; and $S^* = \pi' X_S + \varepsilon_S$

$\Rightarrow Z^* = D^* - S^* = \eta' X_D - \pi' X_S + \varepsilon_D + \varepsilon_S$

$\Rightarrow Z^* = \alpha' X + \mu \quad : \mu \approx N(0, \sigma_\mu^2)$ ....(4.81)

Where Z^* is latent variable, X is a vector of exogenous variables that explain the excess demand for loan, α is a vctor of parameters. μ is a random error term, assumed to be normally distributed with mean zero and variance σ_μ^2, and it is assumed that $\sigma_\mu^2 = 1$.

Now Z^* is not observed; what we observe only a binary outcome - whether a person is borrowing constrained or not. Hence a criterion function using a dummy variable Z is defined as following:

$Z = 1$ iff $Z^* = \alpha' X + \mu \geq 0 \Rightarrow$ The person is borrowing constrained ...(4.82)

and $Z = 0$: otherwise. $\Rightarrow$ The person is not borrowing constrained.

The vector of parameters α is estimated using linear probability model estimation method. Then the predicted value of Credit Constraint (PCC) is computed for use in ensuing estimations.

The excluded variables/instruments used in the first stage to estimate the credit constraints equation are – inability to post collateral, diverted loans on earlier occasions (type of moral hazard), willingness to borrow more if interest rates are reduced, bureaucratic delay and bribes in the sanction of a loan, prefer to borrow from friend and relative, and percentage of loan amounts borrowed from friend and relatives. These additional instruments realistically influence the level of borrowing constraints of a person, but do not directly affect the "Credit impact" variable. If first stage regression comes out to be significant enough (say F statistic bigger than 10), implying that instruments are relevant and strong, then it strengthens the inferences of second stage estimations and gives credible evidence of causality. Some of the additional potential instruments could be - proximity to a bank, government's specific enabling legislations related to access to credit etc.

The first stage linear probability regression results are reported in Table 4.8. The Wald statistic is satisfactorily high in the case of India which implies good significance of the estimation model. However in the case of China it is on lower side, but the significance of regression remains valid. Also many variables are individually significant in the case of India. We are not interested in analyzing the marginal effects of variables rather we are more interested in the second stage regression and inferring on causal effect of credit constraints on food security, input applications in farming, and health and educational attainments represented by a composite variable "Credit Impact". It is evident that the education, household assets and income, ability to post collateral, preferences of borrowing are important explanatory variables for credit constrainedness.

Table 4.8: First Stage Linear Probability Regression Results

Dependent variable : Credit constraint	India			China		
	Coef.	Std. Err.	T	Coef.	Std. Err.	t
Age	-0.01	0.01	-0.91	-0.13	0.12	-1.1
Age sq (7.87e-5)	0.00	0.00	0.7	0.023	0.02	1.03
Household size	-0.02*	0.007	-2.5	-0.002	0.01	-0.18
Education	-0.085*	0.030	-2.87	0.005	0.03	0.19
Income Source	0.148*	0.061	2.42	0.002*	0.00	2.04
Log asset per capita	-0.093*	0.033	-2.79	0.034	0.03	1.35
Log income per capita	-0.105*	0.043	-2.46	-0.032	0.03	-1.07
Lack collateral	-0.09*	0.048	-1.89	0.12*	0.04	3.04
Moral hazard	0.127*	0.049	2.59	0.050	0.04	1.15
Likely to borrow if interest rates are low	-0.30*	0.121	-2.47	-0.042	0.05	-0.81
Bureaucratic delay and bribe	0.23*	0.095	2.45	0.036	0.04	0.9
Prefer to borrow from friend and relative	-0.15*	0.048	-3.12	0.001*	0.00	1.82
Percentage of loan owed to friends	0.00	0.001	0.74	-0.131	0.12	-1.06
region6	-0.036	0.070	-0.51	0.14*	0.04	3.29
region8	0.356	0.074	4.83			
region9	-0.035	0.066	-0.53			
_cons	3.152	0.503	6.26	0.375	0.36	1.04

India : N = 399 ; F(16, 382) = 8.00 ; Adj R-squared = 0.22
China: N = 659; F (13, 645) = 3.26; Adj R-squared = 0.043

The second stage equation (4.80) is estimated using probit regression method and the results are reported in table 4.9. The dependent variable is "Credit impact" in the case of India, however in the case of China its stronger version "Credit impact1" is used.

Table 4.9: Second Stage Probit Regression Results

Dependent Variable : Credit impact	India		China			
	Coef.	z	Coef.	Z	Coef.	z
Predicted value of Credit Constraint	2.90*	3.42	1.39*	2.43	0.71	0.9
Age	0.03	0.73	-0.36	-0.92	-0.45	-1.1
Age square (7.87*10e-5)	0.00	-0.68	0.06	0.86	0.08	1.07
Household size	0.03	1.03	-0.05	-0.94	-0.04	-0.9
Education	0.32*	2.18	-0.02	-0.18	-0.01	-0.2
Income Source (Farming=1)	0.19	0.63	0.00	0.8	0.00	1.18
Log asset per capita	0.19	1.32	-0.08	-0.92	-0.05	-0.6
Log income per capita	0.24	1.19	0.06	0.59	0.05	0.48
region6	-7.04*	-2.24			0.23	1.26
region8	-5.76*	-1.73				
region9	-6.66*	-2.11				
_cons	-0.61	.	-0.8	-0.61	-0.80	-0.6

India: N = 399 ; LR chi2(11) = 135.09 ; Pseudo R2 = 0.35
China: N = 645; LR chi2(8) = 12.35; Prob > chi2 = 0.12; Pseudo R2 =0.0239
China: N = 645 ;LR chi2(9) = 13.94 ; Prob > chi2 = 0.12 ; Pseudo R2= 0.0269

Clearly the regression results are quite significant in the case of India because of highly significant likelihood ratio statistic, but the regression results does not seem to be significant in the case of China , however these are nearly significant at 10 percent significance level. Again we are not interested in the marginal effects of variables. Our main interest lies in the sign and significance of the predicted value of credit constraint variable obtained from the first stage. Following these regression results, important inferences are stated as following:

1. In the case of India, the predicted value of credit constraint is found to be positive and significant. It is also found to be robust when other variables are included or excluded. This finding gives credence to hypothesis 1 and we reject the null in favor of alternative that a credit constraint is positively associated with Credit impact. Also as discussed earlier we can make causal claim that credit constraints

affect food security, input applications in agriculture, and better health and educational attainments.

2. In the case of China, also the predicted value of credit constraint is found to be positive and significant. But it is not found to be robust, as by adding the regional dummy its significance vanishes, however it bears the desired sign. The results are shown in the columns 8 and 9 of the table 12. This finding gives weak credence to hypothesis 1.
3. Further the probability of Credit impact =1 is plotted against predicted values of credit constraint in Figure 4.3. It is apparent that in the case of both the countries the probability of credit impact =1 is increasing with higher values of credit constraint. This gives credence to hypothesis1, that higher values of credit constraint adversely affects food security, input applications in farming, and health and educational attainments represented by a composite variable "Credit Impact"

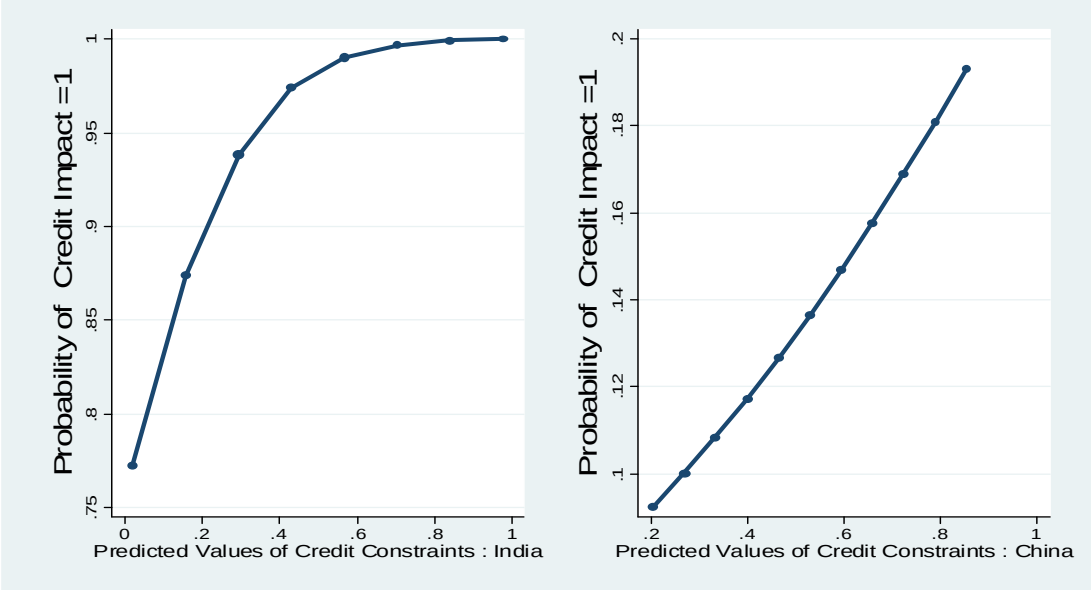

Figure 4.3: Positive relation between Credit constraints and Credit impact

As this methodology does not provide robust evidence in the case of China, further investigations are made using propensity score method. In its simplest form following steps are followed: (i) Binary variable Credit constraint is regressed on explanatory variables using probit regression and predicted values (propensity scores) are generated. (ii) Then Credit impact is regressed on Credit constraint variable controlling for propensity score obtained from first stage regression and also the interaction term. (iii) The significant coefficient on the "Credit Constraint" indicates causal effect of credit constraint on "Credit impact".

The results are reported in Table 4.10. Clearly in the case of China the credit constraint variable turns out to be significantly positive, which indicates causal effect as conjectured and evidence in support of the hypothesis is obtained in the case of China also. However in the case of India, we do not get significant results as coefficient of credit constraint is not positively significant. However coefficient of predicted values of credit constraint is positive and significant that indicates desired causal effect in addition to indicating that credit constraints are not randomly assigned. Further when only interaction term is used as additional control then the desired causal effect is obtained.

Table 4.10: Causal Effect of Credit Constraint on Credit impact using Propensity Score Method

Dependent Variable : Credit impact	China		India			
	Coef.	z	Coef.	z	Coef.	z
Credit constraint	0.37*	2.88	-0.14	-0.69	.37*	2.4
Predicted values of credit constraint: p1	2.11*	2.57	2.42*	4.13		
Interaction of Credit constraint and mean removed value of p1	-1.69	-1.57	-0.71	-0.96	1.7*	3.7
_cons	-2.35	-5.55	-0.45	-1.67	.59*	5.3

China: N = 659; LR chi2(3) = 17.97; Prob > chi2 = 0.0004; Pseudo R2 = 0.0340
India : N = 399 ; LR chi2(3) = 43.16; Prob > chi2 = 0.00; Pseudo R2 =0.11

Also the mean values of "Credit impact" are computed for the two categories of respondents – namely, one who are credit constrained and another who are not credit constrained as assigned in the data. It is further subcategorized along the increasing quintiles of propensity score of credit constraints. The results are reported in Table 4.11. Two key inferences are evident from this table as mentioned below:

1. The value of "Credit impact" is normally increasing for higher quintiles of propensity score for both categories of people.

2. The value of "Credit impact" is normally higher for people who are assigned as credit constrained in comparison to that of people who are assigned as not credit constrained, for each quintiles of propensity score of credit constraint.

These two key findings give credence to hypothesis 1 – that credit constraints are positively associated (also causality) with "Credit impact" or increasing levels of credit constraints negatively affect food security, input applications in farming, and better health and educational attainments.

Table 4.11: Mean Values of Credit impact for 5 quintiles of Propensity Score

Quintile of Propensity Score	China		India	
	Impact for Credit Constraint=1	Impact for Credit Constraint=0	Impact for Credit Constraint=1	Impact for Credit Constraint=0
1	0.125	0.032	0.67	0.549
2	0.214	0.065	0.76	0.718
3	0.125	0.116	0.74	0.814
4	0.219	0.220	0.87	0.947
5	0.202	0.071	0.93	0.9
Total	0.181	0.094	0.82	0.719

These observations are graphically shown in Figure 4.4. Clearly in the case of both the countries higher values of credit constraint are normally associated with higher values of "Credit impact" and also these values are usually higher for the people who are assigned as credit constrained.

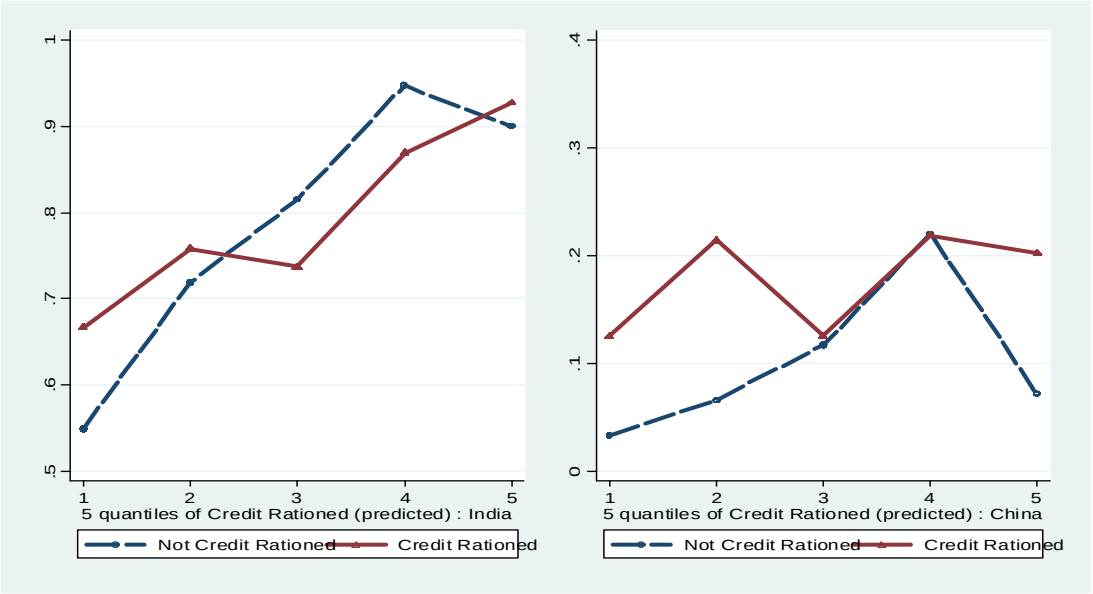

Figure 4.4: Positive Relation of Credit Constraint and Credit impact

Essentially it has been shown that credit constraints adversely affect key livelihood choices such as, food consumption, farm input applications, and health and educational attainments.

4.5. Conclusion

The main objective of this chapter is to investigate the impact of credit constraints on various aspects of livelihood choices such as, physical capital formation, human capital formation, agricultural inputs application, consumption smoothing, whether to become entrepreneur or wage seeker etc. Investigation of impacts of credit constraints on farm input applications and wage seeking has been done using a static optimization framework. The analysis demonstrates that a credit constrained farmer uses suboptimal amount of farm inputs when the credit constraint is binding. Furthermore, if credit constraint tightens beyond a threshold level then the farming may not be remunerative and he prefers wage labor. However, increasing number of wage seekers

put a downward pressure on wage and thus wage market outcome is also adversely affected.

Analysis of impact of credit constraints on various livelihood choices such as, capital investment (physical and human), consumption, leisure, and decision to either become an entrepreneur or wage seeker has been done using dynamic optimization framework. The results demonstrate that credit constraints affect consumption smoothing, and physical capital and human capital accumulation are also adversely affected. Furthermore comparative levels of physical capital and human capital accumulation influence the decisions of becoming an entrepreneur or wage seeker. Some of these results are empirically investigated using the household survey data from China and India. Using suitable econometric methods it has been shown that credit constraints negatively affect food consumption, farm inputs applications, and health and educational attainments.

However the empirical findings would have been more robust if data can be obtained either pertaining to some natural experiment or ideally relating to a randomized experiment. However, it is difficult, expensive and time consuming to get access to such data sets. Also if panel data on observations are available then unobserved heterogeneities can be controlled. Future research may pick up on these ideas and can come up with more insights on impacts of credit constraints.

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Chapter 5: The Economics of Risk Sharing and Consumption Smoothing

In the rural areas of developing countries people face various types of risks and uncertainties. Well functioning credit and insurance markets usually enable people to face these risks and uncertainties in the developed countries. However, as investigated in Chapter 3, it is evident that a large proportion of people in the rural areas of developing countries face credit rationing. Similarly these people have limited access to insurance markets. This chapter's main contribution is to provide helpful insights on risk sharing and consumption smoothing motivations and mechanisms of these families. The three important mechanisms analyzed are – precautionary savings, risk sharing informal insurance and credit transactions. The household survey data from China and India provide significant inferences on the analytical results. It has been found that the families are willing to pay for insurance coverage as high as 15-20 percent of the annual income.

5.1. Introduction

In the developing countries particularly in the rural areas, people face severe challenges in arranging finance for consumption and production purposes. The standard assumptions of complete markets including that of credit and insurance markets generally do not hold in reality. The price mechanism particularly in credit and insurance market is intrinsically limited by transaction costs and information and enforcement costs[26]. Consequently optimal allocation of resources and hence fulfillment of effective demand of credit and insurance is not attained. The issues

[26] See Hoff, Braverman, and Stiglitz (1993) for more on this.

related with credit rationing in formal credit market in these areas have been investigated in detail in Chapter 3.

Furthermore, heavy dependence on farm related activities expose these families to substantial fluctuations in their income. In absence of adequate access to credit and insurance arrangements often these fluctuations (partially) translate into consumption fluctuations (Udry 1994, Townsend 1994, Townsend 1995). Consumption fluctuations are usually painful for the families and these imply welfare loss for the risk averse agents having convex preferences over goods across various states and time periods. In absence of well functioning credit and insurance markets these families resort to various ex ante and ex post measures to smooth their consumptions (Morduch 1995, Kochar 1995). Risk sharing using financial (gifts and loan transactions) and non financial transactions among close acquaintances is a widely documented method to smooth consumption intertemporally (Udry 1994, Townsend 1994, Townsend 1995, Rosenzweig 1988). Several studies including the above have shown that the friends and relatives give gifts and advance credits at low interest rates as a mutual support and insurance arrangements. The next chapter aims to develop an analytical framework to investigate the underlying motives for such financial transactions among friends and relatives in these areas, and also to empirically test some of the results obtained from this analysis.

In the literature risk sharing motive has been advanced as an important explanation of informal financial transactions among relatives and friends. Hence this chapter's main objectives are - (i) to understand the importance of various types of risks and uncertainties faced by these families, (ii) to understand the economics of risk sharing and consumption smoothing, and (iii) to investigate into the significance and mechanics of widely used risk sharing and consumption smoothing mechanisms of the risk averse agents.

Household surveys were conducted in rural areas of China (in years 2007 and 2008) and India (in year 2008-09). About 1500 families in China and 400 families in India were surveyed. The survey questionnaires are designed to elicit responses of families related to; (i) the credit rationing problems which they face, (ii) how it affects their livelihood choices, (iii) how they respond to overcome this problem, and (iv) the extent, types and motives for financial transactions among friends and relatives.

Some of the important findings from the survey are as following:

(i) The families in these areas mostly depend on farm related activities. The survey data reveals that farm income constitutes about 48 and 57 percent of income of these families respectively in China and India. The coefficients of variation of farm income in both the countries are found to be around 34 percent, which is reasonably high. This creates substantial uncertainties in their income. So insurance and credit becomes an important input for livelihood for most of the families.

(ii) Further formal credit markets - banks and rural credit cooperatives (RCC) are not well developed in such areas. The data reveals that more than 60 percent of these families have been either denied loan or got less than the asked amount of loan from the banks and credit cooperatives. Also in these areas informal borrowing constitutes a large portion of total borrowing. The data reveals that informal borrowing constitutes about 64 and 37 percent of total borrowing of these families respectively in the case of China and India. The data further reveals that these loan are taken not only for production purposes, but also to meet the urgent needs such as, consumption, health, funeral expenses etc.; in both the countries almost 25 percent of the borrowings seem to be done for such purposes.

(iii) So also the insurance markets are not well functional in these areas. For example, in the case of India 90 percent families show their willingness to buy crop insurance, whereas only 34 percent families have actually bought this, in the case of China these

percentages are 75 and 18 respectively. In absence of well functioning insurance markets, the importance of credit is further enhanced (Eswaran and Kotwal, 1989).

(iv) Also the data reveals that large percentages (50 percent) of the families actually prefer informal loans to formal loans.

These findings considerably motivate this chapter. This chapter's main contribution is to provide helpful insights on risk sharing and consumption smoothing motivations and mechanisms of the families living in rural areas of developing economies. The chapter is organized as following.

Section 2 examines risk sharing and consumption smoothing in a competitive environment and also expressions related with socially optimal level of risk sharing have been obtained. Further the risk sharing insurance arrangements are explained here using simple examples. Section 3 investigates into the matters related with various ways of insuring against risk. The three important mechanisms analyzed are; precautionary savings, risk sharing insurance and credit arrangements. A simple analysis related with each of these mechanisms is presented here and useful results are obtained that attempt to explain these mechanisms. Section 4 uses the household survey data from China and India to conduct empirical investigation into the significance of the important results obtained in sections 3. Suitable econometric methods and appropriate identification strategies have been proposed to get evidences on the results related to precautionary savings, risk sharing insurance arrangements and risk sharing credit arrangements. The inferences and evidences are discussed in this section. The findings demonstrate that risk is a major concern for these people and they are willing to pay for insurance coverage as high as 15- 20 percent of annual income. Also satisfactory evidences of life cycle and precautionary motives for savings are obtained. Further, significant evidences are obtained related to risk sharing

insurance arrangements and risk sharing credit arrangements. Section 5 concludes with important observations.

5.2. Analysis of Risk Sharing

The benefit of risk sharing and consumption smoothing is demonstrated by a simple example as following. The household is assumed to be risk averse with strictly concave utility function u(w) = ln(w). His mean income in any period is $750 and he faces a mean zero risk (-$250, 0.5; $250, 0.5) in every period. The utility function and income realizations are shown in Figure 5.1. Because of strict concavity of the utility function the utility gain (cd) in good state is always less than the loss (ab) in bad state.

ab = [ln(750) – ln(500)] = 0.40 > cd = [ln(1000) – ln(750)] = 0.28

So if the household maintains autarchy then over his finite life period her overall utility will be less compared to the situation in which he enters into agreement with another household and tries to smooth the consumption at $750 in each period.

Further, it is assumed that there are two households A and B - the expected utility of each household in any period when they do not share risk is

$[Eu(\tilde{y}_A) = Eu(\tilde{y}_B)]_{\text{no risk share}} = 0.5(\ln 1000 + \ln 500) = 6.56$

But when they share the risk, then

$[Eu(\tilde{y}_A) = Eu(\tilde{y}_B)]_{\text{share risk}} = \ln 750 = 6.62 > 6.56$

Hence, $[Eu(\tilde{y}_A) = Eu(\tilde{y}_B)]_{\text{share risk}} \geq [Eu(\tilde{y}_A) = Eu(\tilde{y}_B)]_{\text{no risk share}}$

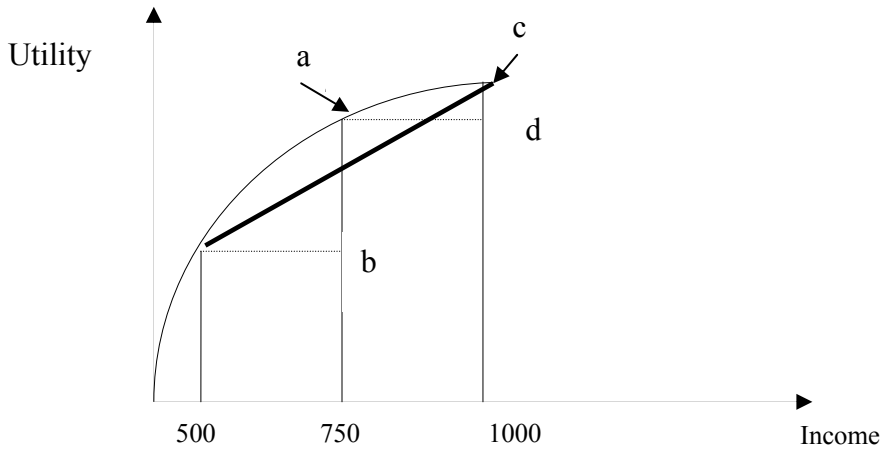

Figure 5.1: Utility representation of a risk averse agent

This simple example neatly demonstrates the benefits of risk sharing and consumption smoothing.

5.2.1 Competitive Risk Sharing and Consumption Smoothing[27]

First risk sharing and consumptions smoothing issues are examined in a competitive economic environment. As a benchmark case, the optimal consumption under no information asymmetry and no borrowing constraints is characterized. The risk sharing in this framework is mediated by savings and credit market. The households, who get less than average income in a period, borrow from the market in that period to smooth consumption. The needed supply comes from the households who get more than average income in that period. The borrowed amount is repaid by the households when they get more than the average income.

Let us consider that there are two households. I assume that the households live for T periods. Each one faces stochastic income $\{y^1{}_t\}_{t=0}^{t=T}$, and $\{y_t^2\}_{t=0}^{t=T}$ over a horizon of time period T. The consumption process of the households are similarly denoted as $\{C^1{}_t\}_{t=0}^{t=T}$ and $\{C^2{}_t\}_{t=0}^{t=T}$. The household with discount factor β chooses consumption each period to maximize expected lifetime utility over his life time of period T. The

[27] Good references are, Townsend (1994), Eeckhoudt, Gollier, and Schlesinger (2005).

utility function $u(c^i_t)$ is assumed to be time and state separable and also assumed to be well behaved ($u'(.)>0$, $u''(.)<0$), which satisfies necessary and sufficient conditions for utility optimization. The consumption plan in equilibrium is obtained by solving

$$\max EU^i = \max_{c^i_t} E\sum_{t=0}^{t=T} \beta^t u(c^i_t) \qquad ...(5.1)$$

Subject to budget constraint: $\sum_{t=0}^{t=T} p_t c^i_t = \sum_{t=0}^{t=T} p_t y^i_t$; λ^i is the lagrange multiplier on the constraint.

Where p_t is the price of consumption (income) in period t, p_0 is normalized to 1, and expression for p_t will be obtained later.

The first order condition with respect to c^i_t in each of the state(s) gives:

$[\beta^t u'(c^i_t)] = \lambda^i p_t$; Now comparing over two consecutive periods, we get

$$\frac{[\beta^t u'(c^i_t)]}{[\beta^{t+1} u'(c^i_{t+1})]} = \frac{p_t}{p_{t+1}} \quad \Rightarrow \frac{u'(c^i_t)}{\beta\, u'(c^i_{t+1})} = \frac{p_t}{p_{t+1}} \qquad ...(5.2)$$

Then the allocations in equilibrium are obtained. The first order conditions for households 1 and 2 (also assuming that there is only one state in each t) imply

$$\frac{u'(c^1_t)}{u'(c^2_t)} = \frac{\lambda^1}{\lambda^2} = \lambda \quad \text{: and also the resource constraint } (\forall t, s)\ c^1_t + c^2_t = y^1_t + y^2_t \quad ...(5.3)$$

Suppose $u(c) = \log(c)$, then

$$c^1_t = \frac{1}{1+\lambda}(y^1_t + y^2_t) \quad \text{and} \quad c^2_t = \frac{\lambda}{1+\lambda}(y^1_t + y^2_t) \qquad ...(5.4)$$

Now expression for p_t will be obtained. Let $p_0 = 1$, then the first order condition implies, $\lambda^1 = 1/c^1_0$, and for all t we get

$$p_t = \beta^t \frac{c^1_0}{c^1_t} = \beta^t \frac{y^1_0 + y^2_0}{y^1_t + y^2_t} \text{ . and if } y^1_t + y^2_t = 2y_m \text{ for all t, then } p_t = \beta^t \qquad ...(5.5)$$

It is assumed that, $y_t^1 = \{y_m - \sigma, y_m + \sigma\}$, which starts with $y_m - \sigma$, followed by $y_m + \sigma$ in next period and this process continues. Similarly $y_t^2 = \{y_m + \sigma, y_m - \sigma\}$. Using this income process, value of λ is computed by equating value of consumption and value of income streams of any household. It is assumed that T is large $\to \infty$

$$\text{Value of consumption of household 1} = \sum_{t=0}^{t=T} p_t c_t^1 = \sum_{t=0}^{t=T} \beta^t \frac{2y_m}{1+\lambda} = \frac{2y_m}{(1+\lambda)(1-\beta)}$$

$$\text{Value of income streams of household 1} = \sum_{t=0}^{t=T} p_t y_t^1 = \sum_{t=0}^{t=T} (\beta^{2t}(y_m - \sigma)) + (\beta^{2t+1}(y_m + \sigma))$$

Simplifying the above equation, following expression is obtained.

$$\sum_{t=0}^{t=T} p_t y_t^1 = \frac{(y_m - \sigma) + \beta(y_m + \sigma)}{1-\beta^2} = \frac{y_m(1+\beta) - \sigma(1-\beta)}{1-\beta^2} = W^1$$

$$\text{Hence } \frac{2y_m}{(1+\lambda)(1-\beta)} = \frac{y_m(1+\beta) - \sigma(1-\beta)}{1-\beta^2} \quad \Rightarrow 1+\lambda = \frac{2y_m(1+\beta)}{y_m(1+\beta) - \sigma(1-\beta)}$$

$$\text{Hence, } \quad \lambda = \frac{y_m(1+\beta) + \sigma(1-\beta)}{y_m(1+\beta) - \sigma(1-\beta)} < 1 \qquad \ldots(5.6)$$

The equations (5.2), (5.4) and (5. 6) have important implications: (i) the concavity of the utility function (u``< 0) implies aversion to consumption fluctuation from period to period, the household attempts to smooth consumption over time; (ii) if aggregate income is same in all periods, then each household completely smoothes his consumption in equilibrium; and (iii) the household who starts with lower income gets less amount of consumption in all periods compared to the household who starts with higher income. These observations are summarized in the following result.

Result 5.1: In the perfect competition, the equilibrium consumption plan displays constant amount of consumption in each period. If income fluctuates over the life cycle of a household, the optimal saving or borrowing strategy in any period t, amounts to save or borrow an amount equal to ($y_t - c_t$).

5.2.2. Socially Optimal level of Risk Sharing and Consumption Smoothing

The needy families engage in mutual risk sharing as discussed in introductory section. In a heterogeneous economy, when the competitive market enables the households to trade in idiosyncratic risks, it improves economic efficiency. However, when the competitive market environment is not available, and assuming that there is a social planner which maximizes the aggregate social welfare of the households; we obtain the same results as obtained in the competitive market environment as analyzed below. This assumption for informal financial transactions among close acquaintances in rural areas is realistic, as among friends and family members in rural areas, information flow is quite symmetric and such risk pooling has been empirically verified to a large extent[28]. Using the framework of section 3.1, we can solve for social optimality. It is assumed that Pareto weight of the welfare of household 1 is $\mu \in (0,1)$. Hence the social planner maximizes

$$\max_{\{c_t^1, c_t^2\}} E\{\mu \sum_{t=0}^{t=T} \beta^t u(c_t^1) + (1-\mu) \sum_{t=0}^{t=T} \beta^t u(c_t^2)\} \qquad ...(5.7)$$

Subject to Resource constriant in every state (s) and every time period t

$c_t^1 + c_t^2 \le y_t^1 + y_t^2$: λ_t is Lagrange multiplier

Now the first order condition with respect to c_t^1 and c_t^2 for all s and t gives

$$\frac{u'(c_t^1)}{u'(c_t^2)} = \frac{\mu}{1-\mu} \qquad ...(5.8)$$

Hence ratio of consumption of the two households in all states and periods is constant, which implies that consumption is completely smoothened and risk is perfectly shared. For example if $u(c) = \log(c)$ then

$c_t^1 = \mu(y_t^1 + y_t^2)$ and $c_t^2 = (1-\mu)(y_t^1 + y_t^2)$ for all s and t.

[28] Good references are, Townsend (1994), Coate and Ravallion (1993), Ligon, Thomas and Worrall (2001), and Fafchamps and Lund (2003)

However complete risk sharing needs satisfaction of two necessary conditions[29] – (i) there is no aggregate uncertainty across periods, and (ii) the risk averse agents have same priors about the states of uncertainty in each period. These conditions are quite strict and in reality we observe only imperfect risk sharing.

2.3 Risk Sharing using Informal Insurance Arrangements

Now the question arises- if mutual risk sharing is so beneficial for the members of a village, then why such risk sharing arrangements do not sustain on its own. As risk sharing entails intertemporal optimization of utility, one important factor which determines the sustenance of risk sharing arrangements is the patience factor (β) of the participating households. Depending on the stochastic income process and the time horizon perspective of the agents, it requires that $\beta > \beta^*$ (where β^* is a threshold value of patience factor) to sustain the mutuality. However, if $\beta < \beta^*$, then the household may find it beneficial to defect as the short term gain may exceed the long term gain achieved from the mutuality. This is demonstrated in an infinite horizon expected utility optimization framework as following[30].

Let us consider an economy populated with large number of people with identical preferences, described by utility function $u(c) = \ln(c)$. It is assumed that the people maximize their utility in an infinite horizon time frame. The people are divided into two categories – each category of people receives endowments of 2 units with probability 0.5 and 4 units with probability 0.5 in every period, and the endowment of these categories of people are perfectly negatively correlated. Hence in every period per capita availability of endowment is 3 units of consumption good. Also it is assumed that there are no borrowing and lending opportunities available to the people.

[29] This follows from Mas-colell and others (1995), chapter 19

[30] This illustration draws ideas from Ljungqvist, L. and Sargent, T. J. (2004), Chapter 20.

Now let us examine the utility maximization of the people in following arrangements.

5.2.3.1 Arrangement 1: Autarchy

In this arrangement people consume their own endowment. The expected utility level associated with this arrangement is,

$$U_{aut} = \sum_{t=0}^{t=\infty} \beta^t [0.5u(2) + 0.5u(4)] = \frac{1.04}{1-\beta} = 5.20 \text{; for discount rate } \beta = 0.8$$

5.2.3.2 Arrangement 2: Perfect Insurance

It is assumed that there is a social planner who ensures perfect insurance to all agents such that every one is ensured 3 unit of consumption good in each period. The utility level associated with this arrangement is,

$$U_{pool} = \sum_{t=0}^{t=\infty} \beta^t u(3) = \frac{1.10}{1-\beta} = 5.50 \text{; for discount rate } \beta = 0.8$$

5.2.3.3 Arrangement 3: Self Sustaining Insurance

It is realistically assumed that there is no social planner. People enter into insurance arrangements with each other with an objective to smooth their consumption. For self sustaining of such arrangements it is required that the participation constraint of each of the agents is satisfied in every period.

Let us consider that this arrangement delivers consumption level of c and 6-c to the agents with current endowment of 4 and 2 units respectively. Obviously the participation constraint of the former agent will be binding and the participation constraint of the latter agent will be always satisfied.

$$u(c) + \beta U_{cont} \geq u(4) + \beta U_{aut} \qquad ...(5.9)$$

Here U_{cont} is agent's continuation value of remaining in this arrangement – that satisfies

$$U_{cont} = 0.5[u(c) + \beta U_{cont}] + 0.5[u(6-c) + \beta U_{cont}]$$

$$\Rightarrow U_{cont} = \frac{0.5[u(c) + u(6-c)]}{1-\beta}$$

Now substituting back into equation (5.9), we get

$$\text{u(c)} + \beta * \frac{0.5[u(c) + u(6-c)]}{1-\beta} = u(4) + \beta * 5.20$$

$$\Rightarrow u(c) + 2 * [u(c) + u(6-c)] = u(4) + .8 * 5.2$$
$$3u(c) + 2 * u(6-c) = 5.55$$

The value of c turns out to be 3.2. The optimal contract has c=3.2 and that attains the expected utility level

$$U_{cont} = \frac{0.5[u(c) + u(6-c)]}{1-\beta} = \frac{0.5[\ln(3.2) + \ln(2.8)]}{1-\beta} = 5.47$$

This level of expected utility is smaller than that of perfect insurance but bigger than that of autarchy with no insurance at all. Thus if people enter into insurance arrangements then the consumption can be smoothed to a large extent and higher expected utility level can be achieved. Also for a sufficiently higher value of β (people are patient enough); the perfect insurance arrangement can be achieved. Such value of β is calculated as following

$$U_{pool} \geq u(4) + \beta U_{aut}$$

$$\Rightarrow \frac{1.10}{1-\beta} \geq \ln(4) + \beta * \frac{1.04}{1-\beta} \qquad \Rightarrow \beta \geq 0.84$$

Hence if people value greatly the future streams of consumption then perfect insurance arrangement can be self sustained and highest level of expected utility can be attained.

5.2.3.4 Pareto Frontier Plotting

These arrangements are diagrammatically shown in Figure 5.2 and Figure 5.3. The utility function is assumed to be ln(c+b), where b=5 is a constant and non varying endowment and c is the varying part of endowment. The endowment of type 1 agent is y_t and the endowment of type 2 agent is 1- y_t, where y_t is assumed to independently and identically distributed such that

$\Pr ob(y_t = y_s) = \pi_s = 1/S;\ \ y_s = s/S;\ s = 1,2,..,S; \qquad S = 4;$

Now in this framework, $U_{aut} = \sum_{s=1}^{s=S} \pi_s u(y_s)/(1-\beta)$

Also the perfect risk sharing arrangements entails, $U_1 = \frac{u(c)}{1-\beta}, and\ \ U_2 = \frac{u(1-c)}{1-\beta}$. The graph (U_1, U_2) plots the Pareto frontier as c varies from 0 to 1.

Further the self sustaining participation constraints are described as following:

$$u(c_t) + \beta E_t(\sum_{j=0}^{j=\infty} \beta^j u(c_{t+j})) \geq u(y_t) + U_{aut}$$

$$u(1-c_t) + \beta E_t(\sum_{j=0}^{j=\infty} \beta^j u(1-c_{t+j})) \geq u(1-y_t) + U_{aut}$$

The above participation constraints imply values of V_1 and V_2 that solve

$V_1 = u(y_S) + \beta U_{aut};$ and $V_2 = u(1-y_S) + \beta U_{aut}$

V_1 is the minimum value of U such that the participation constraint for type 1 agent will never bind , and similarly V_2 is for type 2 agents. Now in the plotted graph, evidently there is a part of the (U_1, U_2) frontier which satisfies, $U_1 \geq V_1$ and $U_2 \geq V_2$ as shown in Figure 5.2. However if β is lowered enough then such region disappears and perfect risk sharing can not be achieved anymore, as shown in Figure 5.3, for β=0.8 .

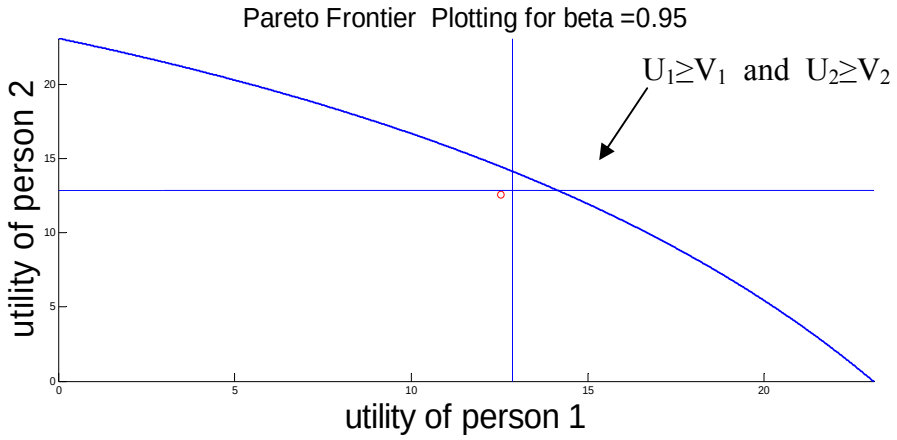

Figure 5.2 : Informal Insurance Arrangements for β=.95

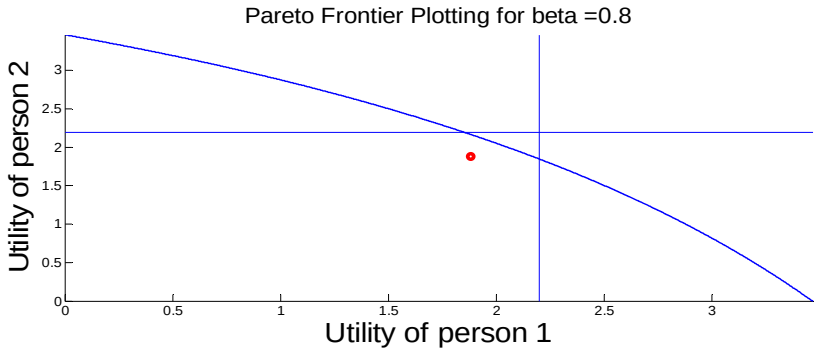

Figure 5.3: Informal Insurance Arrangements for β =0.80

5.3. Ways to Insure Against Risks

If people have access to credit and insurance markets in these areas then combination of these contracts can be used to attain consumption smoothing, as shown in Townsend (1994). Credit contracts helps in adjusting consumption across time and insurance contacts takes care of idiosyncratic shocks. But as investigated in Chapter 3 recourse to this option is limited because of various reasons.

The wealth endowment of a household is an important factor which influence the credit availability from the formal credit market for two reasons[31] - (1) More the wealth endowments, more the own fund can be invested in the project and less the amount of credit is needed to take up a project of specified loan and that weakens the moral hazard constraint. (2) More the wealth a borrower has, more the collateral he can post and bargain for better terms for lending that weakens the adverse selection effect.

The credit rationing issues have been examined in detail in Chapter 3. These rural families face similar problems related to agricultural and related insurance markets. However the survey data reveals that the people are much willing to pay premiums to get such insurance coverages. The poor families with lower wealth endowments may get credit rationed in the formal market and then they may turn to informal sector to meet their credit requirements. Further they may enter into informal risk sharing insurance arrangements. Also the families depending on their financial capacity and risk perception engage in precautionary savings. These issues are examined next.

5.3.1 Willingness to pay for Insurance Coverage

As discussed in the introduction, a large percentage of the rural families show their willingness to buy crop and livestock insurances. This demonstrates their desire to smooth consumption. Here a brief analysis is presented to quantify this willingness to pay for the premium and also evidence is presented using the survey data from China and India.

In absence of credit market, consumption equals income in any period. Consumption can be smoothened through insurance arrangements, using premium '$\pi(y)$' such that;

$u(y_m - \pi(y)) = E[u(y_t)]$, where $y_m = E[y_t]$

[31] Followed from Holmstrom and Tirole (1997)

The premium amount $\pi(y)$ shows the intensity of desire to smooth consumption over time in absence of credit market.

Taking first order Taylor expansion of $u(y_m - \pi(y))$ around y_m and second order Taylor expansion of $E[u(y)]$ (subscript t dropped for neatness) around y_m, we get:

$$u(y_m) - u'(y_m)\,\pi \approx E[u(y_m) + u'(y_m)(y - y_m) + u''(y_m)(y - y_m)^2/2]$$

Now using $E[(y - y_m)^2] = \sigma_y^2 = \text{variance of income}$; and $\frac{\sigma_y}{y_m} = CV_y$ = Coefficient of variation of income, we get

$$\frac{\pi}{y_m} \approx -\frac{1}{2}\frac{y_m u''(y_m)}{u'(y_m)}\left(\frac{\sigma_y}{y_m}\right)^2 = \frac{1}{2}\gamma(y)(CV_y)^2 \qquad \ldots(5.11)$$

The multiplicative factor, $\gamma(y) \equiv -yu''(y)/u'(y)$ is called the measure of relative fluctuation aversion (empirically observed in the range of .5 to 4) and is an analogue to the Arrow-Pratt measure of relative risk aversion (Eeckhoudt, Gollier, and Schlesinger, 2005). It basically illustrates the negative welfare costs of uninsured risks (Morduch, 1995) measured by the amount of money a family is willing to pay for completely removing the variability in income to smooth the consumption. These observations are summarized in the following result:

Result 5.2: If σ^2 is the variance of income realizations over a period T and y_m is the mean value of income, and coefficient of variation, $CV_y = \sigma/y_m$, then the risk premium can be defined as the minimum amount which a risk averse agent is willing to pay to avoid fluctuations in her consumption across dates and is expressed as:

$$\pi(y)/y_m = (1/2)(\sigma/y_m)^2\,\gamma(y) = (1/2)(CV_y)^2\,\gamma(y)$$

5.3. 2 Precautionary Savings

If people have sufficient income (endowments) in good times then they can use these assets in bad times to smooth consumption. Also the assets may be transferred to deficit families to smooth consumption. Precautionary saving is more than optimal amount of saving which is motivated by uncertainty in income prospects and risk aversion –Sandmo (1970)[32]. This is briefly illustrated as following.

5.3.2.1 Uncertainty and Precautionary Savings[33]

A simple two period model is considered with a sure income y_0 in period 0, but an uncertain income $\tilde{y}_1$ in the second period. The household chooses s the amount of savings (or borrowings) at date 0 to maximize life time utility:

$$\text{Max}_{(s)}\ V(s) = u_0(y_0 - s) + \delta E u_1((1+r)s + \tilde{y}_1) \qquad \ldots (5.12)$$

With usual concavity assumptions of u (.), the first order condition (necessary and sufficient) for s* is written as:

$$u`_0(y_0 - s^*) = (1+r)\,\delta\, Eu`_1((1+r)s^* + \tilde{y}_1) \quad .. \qquad \ldots(5.13)$$

The uncertainty affecting future incomes induces the precautionary motive for saving, s* which relies on a prudent behavior (u```> 0).

s* exceeds optimal saving $\hat{s}$, when the uncertain income process $\tilde{y}_1$ is replaced by its expectation:

$$\max_s \hat{V}(s) = u_0(y_0 - s) + \delta u_1((1+r)s + E\tilde{y}_1) \quad .. \qquad (5.14)$$

Now the first order condition (necessary and sufficient) for $\hat{s}$ is written as:

$$u`_0(y_0 - \hat{s}) = (1+r)\,\delta\, u`_1((1+r)\hat{s} + E\tilde{y}_1) \quad .. \qquad (5.15)$$

Now comparing equations (5.13) and (5.15) and using Jensen's inequality, it can be verified that $\hat{s} < s^*$. This observation is expressed in the following result.

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[32] Good references are Browning and Lusardi (1996), Kimball and Weil (2004) etc.

[33] The ideas are followed from, Eeckhoudt, Gollier, and Schlesinger (2005).

Result 5.3: A prudent household saves more in the face of uncertain prospects of income. Such excess savings may lock up productive assets, which could have been used productively to improve the income streams of the household.

It is further shown that the mutual risk sharing arrangements Pareto dominates the precautionary saving strategy in the sense that it may not attain the level of utility as that is achieved from complete risk sharing. It is assumed that the households are prudent, i.e. the coefficient of absolute prudence, P (w) = - u```(w)/u``(w) > 0 , (Kimball ,1990) .

As there are two states of the nature ($\tilde{y} = (\bar{y} + x, 0.5; \bar{y} - x, 0.5)$) , but only one asset (risk free saving assets with gross return rate (1+r)) is available, hence the risk cannot be hedged and the households must bear the risk. Now I assume that at date 0 an agent's wealth endowment is \$750 and at date 1 she faces the above uncertainty of income. It is also assumed log utility function for the household. ; u(c) = log(c)

Now using the first order condition of equation (5.13):

$u`_0(y_0 - s^*) = (1+r)\,\delta\, Eu`_1((1+r)s^* + \tilde{y}_1)$ .. (5.13)

$$\Rightarrow \frac{1}{(y_1(0) - s^*)} = (1+r)\delta * 0.5 * [\frac{1}{((1+r)s^* + \bar{y} - x)} + \frac{1}{((1+r)s^* + \bar{y} + x)}]$$

Then using the values as mentioned above and for simplicity assuming δ =1, r =0, we get s* = 39.6 and , gross expected utility of period 0 and period 1 is (6.56 + 6.61) – which is less than 6.62 in each period achieved from mutual sharing of risk.

Also if u```> 0 then fully differentiating equation (5.13) with respect to x (amount of uncertainty), we get

$$\frac{ds^*}{dx}\{\frac{1}{(y_1(0) - s^*)^2} + \frac{d}{b^2} + \frac{d}{a^2}\} = d\{\frac{1}{b^2} - \frac{1}{a^2}\} > 0 \qquad ...(5.16)$$

where, $d = (1+r)\delta * 0.5$, $b^2 = ((1+r)s^* + \bar{y} - x)^2$ and $a^2 = ((1+r)s^* + \bar{y} + x)^2$

Hence, $ds^*/dx > 0$ ... (5.17)

i.e. precautionary savings increases with the amount of uncertainty. The following result summarizes above observations.

Result 5.4: Risk sharing leads to increased expected utility of agents in every period. If risk sharing opportunities are not available then agents may engage in precautionary savings. However the gain in expected utility from precautionary savings will be less in comparison to gain from efficient risk sharing.

5.3.3 Credit Transactions among Family Members and Friends

As discussed earlier, because of wealth endowment and risk type heterogeneity a large number of households are credit rationed in these areas. These credit rationed households obtain loans from relatives and friends. Moreover in rural societies, where the family and friends networks are well functioning – the households may enter into mutual support system of helping each other by means of advancing loan at low interest rate. Usually in such risk sharing credit transactions the repayment is state contingent (Udry, 1994). The issues related with informal credit transactions and risk sharing motives are investigated in chapter 6. However, a simple illustration and later a simple analytical model is presented, which lays the foundation for the next chapter.

5.3.3.1 Illustration of Loan and Insurance Arrangement

Let us assume that A and B are two types of agents. A's income in odd periods is \$500 and \$1000 in even periods. B's income follows opposite of this. If the households engage in mutual risk sharing, then each consumes \$750 in each period. So the aggregate discounted utility is

$$\sum_{t=0}^{t=\infty} \beta^t \ln(750) = \ln 750 / 1-\beta = 6.62 / 1-\beta$$

Now the household whose income is $1000 in period 0, defects and consumes expected income for remaining life time, her aggregate discounted expected utility is

$$\sum_{t=0}^{t=\infty} \beta^{2t}[\ln(1000) + \beta \ln(500)] = [(6.90/(1-\beta^2)) + \beta * 6.56 / 1-\beta^{2}]$$

Now mutuality will be beneficial for the families only if

$U_{\text{Risk Share}} \geq U_{\text{Better income at date 0}} + EU_{\text{Autarchy}}$

$$6.62/1-\beta \geq [(6.90/(1-\beta^2)) + \beta * 6.21/1-\beta^{2}] \quad \Rightarrow \quad \beta \geq 0.72 = \beta *$$

So if families' patience factor is less than β *, then mutuality breaks down. However the introduction of loan element can alleviate the situation.

A very simple endowment and loan scheme (for four periods) between household A and B is shown in the Table 5.1.

Table 5.1: Example of Informal Credit Transactions

Period	A's endowment	Loan from A	Post loan income	B' s endowment	Loan to B	Post loan income
1	500	250	750	1000	250	750
2	1000	-270	730	500	-270	770
3	500	250	750	1000	250	750
4	1000	-270	730	500	-270	770

Household A begins in period 1 with lower endowment of $500, whereas the Household B starts with better endowment of $1000 – A takes a cheap loan of $250 in period 1 and pays back $270 next period. After each two period the cycle repeats. From A's side there is no problem in participation. He is ready to participate for all values of δ <1.0. Now the participation constraint of B is examined. The discounted sum of utility of B if he participates in the loan process is as following

$$\ln(750) + \beta \ln(770) + \beta^2 \ln(750) + \beta^3 \ln(770) + \ldots = [\ln(750)/(1-\beta^2) + \beta \ln(770)/(1-\beta^2)]$$

And the discounted sum of utility if he does not avail the loan scheme is

$$\sum_{t=0}^{t=\infty} \beta^{2t} \ln(1000) + \beta^{2t+1} \ln(500)] = 6.90/(1-\beta^2) + \beta * 6.21/(1-\beta^2)$$

Hence the minimum value of β that sustains this arrangement requires that

$$[\ln(750)/(1-\beta^2) + \beta \ln(770)/(1-\beta^2)] \geq \quad 6.90/1-\beta^2 + \beta * 6.21/1-\beta^2$$

Hence, $\beta \geq 0.63 = \beta^*_{loan}$; and $\beta^*_{loan} < \beta^* = 0.72$

This observation is expressed in the following result:

Result 5.5: Introducing a loan element in the process of risk sharing, enables the process to sustain with more impatient agents. It appears that it is a commitment device which secures the participation of more impatient agents – where the plain mutual risk sharing would have broken down.

5.3.3.2 A Simple Model of Loan Transactions and Risk Sharing

It is assumed that there are two agents. Each one faces stochastic income $\{y^1_t\}_{t=0}^{t=T}$, and $\{y^2_t\}_{t=0}^{t=T}$ (with mean value y_m and variance σ^2) over a horizon of time period T. It is further assumed that they enter into an arrangement of risk sharing using credit transactions such that, when an agent faces bad period he borrows from the other on who faces good period of income and borrowed amount is repaid when the first agent faces good period.

It is further assumed that in a period t, the agent 1 gets lower than the average income and the agent 2 gets higher than the average income. In order to smooth his consumption the agent 1 borrows an amount L from the agent 2 at an interest rate i.

Using this loan amount consumable good q is produced according to a well behaved production function,

$$q = \gamma L^{0.5} + \eta L^{0.5}\varepsilon, \qquad \varepsilon \sim N(0, \sigma_1^2) \qquad ...(5.18)$$

Hence amount available for consumption, $c = q + y - [paL + (1-p)bL]$

Here, [paL+(1-p)b L] is repayment obligation, which is state contingent – if good income is obtained in the next period with probability p then aL amount is repaid otherwise bL amount is repaid . The factors a and b are two decision variables. However for simplicity we replace this with a weighted expression gL and g is a single decision variable.

It is further assumed that the agents preferences for consumption is displayed by an exponential utility function; u(c) = -exp (-rc), where r is the coefficient of absolute risk aversion. In this set up, it is well analyzed that the utility maximization decision is equivalent to maximization of certainty equivalent income, CE, which is

$CE = E(c) - (r/2)\,Var(c)$; Hence certainty equivalent income of the agents 1 and 2 are,

$$CE^1 = (\gamma L^{0.5} + y_m - gL) - (r/2)(\eta^2 L\sigma_1^2 + \sigma^2 + 2\eta L^{0.5}\sigma\sigma_1.Corr(q,y)) \qquad ...(5.19)$$

where, $Corr(q,y)$ = correlation coefficient of production and income process.

$$CE^2 = y_m + gL - (r/2)\sigma^2 \qquad ...(5.20)$$

Now if it is assumed that each agent gets good and bad period alternatively, then discounted sum of certainty equivalent for agent 1 and agent 2 at t = 0 is

$$U^1 = \sum_{t=0}^{t=\infty}\beta^{2t}CE^1 + \beta\sum_{t=0}^{t=\infty}\beta^{2t}CE^2 = \frac{1}{1-\beta^2}[CE^1 + \beta CE^2]; \text{ and}$$

$$U^2 = \sum_{t=0}^{t=\infty}\beta^{2t}CE^2 + \beta\sum_{t=0}^{t=\infty}\beta^{2t}CE^1 = \frac{1}{1-\beta^2}[CE^2 + \beta CE^1] \qquad ...(5.21)$$

There are two decision variables here – (i) Loan amount L which is borrowed by the agents in alternate period, starting with agent 1 in t =0, and (ii) repayment factor g such that the repayment obligation is g L.

The risk sharing arrangement is considered a collective decision of these agents; hence a weighted sum of certainty equivalents of both the agents is maximized as following;

$$\underset{\{L,g\}}{\text{Max}}\ U = \alpha U^1 + (1-\alpha)U^2 = \frac{\alpha}{1-\beta^2}[CE^1 + \beta CE^2] + \frac{1-\alpha}{1-\beta^2}[CE^2 + \beta CE^1]$$

Here α is the weight of certainty equivalent of agent 1 and $(1-\alpha)$ is that of the other agent. It is further assumed that, α is a function of g, such that $\alpha(g) > 0, \alpha'(g) > 0,$ and $\alpha''(g) < 0.$

$$\Leftrightarrow \underset{\{L,g\}}{\text{Max}}\ U = \frac{CE^1}{1-\beta^2}[\alpha + (1-\alpha)\beta] + \frac{CE^2}{1-\beta^2}[1-\alpha+\alpha\beta]; \qquad ...(5.22)$$

$$\Leftrightarrow \underset{\{L,g\}}{\text{Max}}\ U = mCE^1 + nCE^2; \quad \text{where } m = \frac{\alpha + (1-\alpha)\beta}{1-\beta^2} \quad \text{and} \quad n = \frac{1-\alpha+\alpha\beta}{1-\beta^2}$$

Then using the expressions of CE^1 and CE^2 from equations (5.19) and (5.20), we get

$$\underset{\{L,g\}}{\text{Max}}\ U = m\{(\gamma L^{0.5} + y_m - gL) - (r/2)(\eta^2 L\sigma_1^2 + \sigma^2 + 2\eta L^{0.5}\sigma\sigma_1.Corr(q,y))\} +$$

$$+ n\{y_m + gL - (r/2)\sigma^2\}$$

Now the first order condition with respect to L implies

$$m\{0.5\gamma L^{-0.5} - g - (r/2)\eta^2\sigma_1^2 - \eta L^{-0.5}\sigma\sigma_1.Corr(q,y)\} + ng = 0$$

Hence, $L^{-0.5}m(0.5\gamma - \eta\sigma\sigma_1.Corr(q,y)) = mg - ng + (r/2)\eta^2\sigma_1^2;$ Solving this, we get

$$L^* = \left(\frac{m(0.5\gamma - \eta\sigma\sigma_1.Corr(q,y))}{mg - ng + (r/2)\eta^2\sigma_1^2}\right)^2 \qquad ...(5.23)$$

And the first order condition with respect to g implies

$m'(g)gL + m(g)L = n'(g)gL + n(g)L;$ Further simplifying this we get,

$$g = \frac{n(g) - m(g)}{m'(g) - n'(g)} = \frac{(1-\beta)(1-2\alpha(g))}{2\alpha'(g)(1-\beta)} = \frac{(1-2\alpha(g))}{2\alpha'(g)} \qquad ...(5.24)$$

Clearly $g > 0$, iff weight of certainty equivalent of agent 1, $\alpha(g) < 0.5.$

Equation (5.24) can be written as following

$$2g\alpha'(g) = 1 - 2\alpha(g) \qquad \text{...(5.24)}$$

This equation pins down the optimal value of repayment factor g. For example, if $\alpha(g) = g^{0.5}$, then $g^* = 0.11$. The left hand side of the equation (5.24) is monotonically increasing function of g and right hand side of the equation is monotonically decreasing function of g, hence a solution of g in the domain of 0 to 1 is guaranteed. This is neatly demonstrated with the help of figure 5.4.

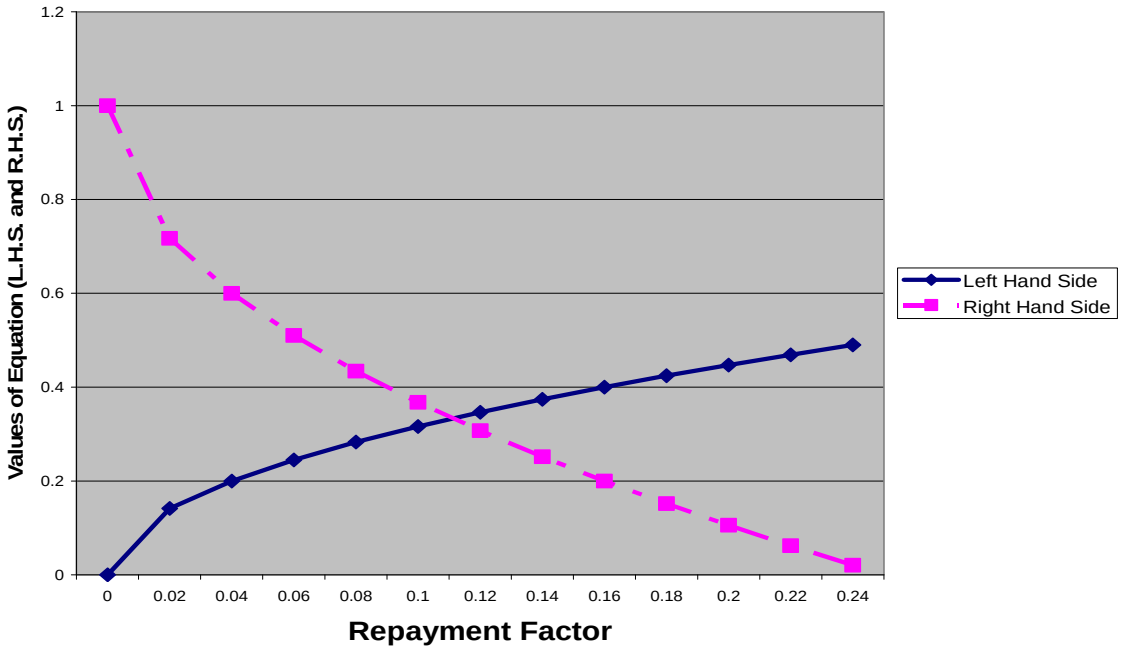


Figure 5.4: Optimal Value of Repayment factor (g)

Further using the equation (5.23) the comparative statics of the optimal loan amount L* with respect to repayment factor g is obtained as following

$$L^* = \left(\frac{m(0.5\gamma - \eta\sigma\sigma_1.Corr(q,y))}{mg - ng + (r/2)\eta^2\sigma_1^2}\right)^2 \text{ ; Let } (0.5\gamma - \eta\sigma\sigma_1.Corr(q,y)) = e;$$

and $mg - ng + (r/2)\eta^2\sigma_1^2 = d$; Hence

$$\frac{\partial L^*}{\partial g} = 2L^{*0.5}(1-\beta)\{\alpha'(g)de + me(1-2\alpha) - me2\alpha'(g)\}\text{; Using equation (5.24), we get}$$

$$\frac{\partial L^*}{\partial g^*} = 2L^{*0.5}(1-\beta)\{\alpha'(g)de\} > 0 \qquad ...(5.25)$$

Equations (5.23), (5.24), and (5.24) provide helpful insights related to the factors which influence the optimal loan amount and repayment factor for risk sharing purpose. We can draw following inferences – (i) Optimal loan amount increases with the productivity factor γ of the production function. (ii) Optimal loan amount is lower for the agents who are more risk averse. (iii) It decreases with increasing uncertainty (variance) of production process. (iv) If income and production process are positively correlated, then optimal loan amount also decreases with increasing uncertainty of income process. (v) The optimal value of repayment factor is determined by the weight function α(g). (vi) The optimal loan amount increases with optimal repayment factor g. This is also quite intuitive, higher repayment commitments leads to larger optimal loan amounts and hence more efficient risk sharing. These findings are summarized in Result 5.6.

Result 5.6: The risk sharing loan amount and repayment rate are collectively determined by the participating agents. The loan amount decreases with increasing uncertainty in income and production process and also with increasing risk aversion of the agents. It increases with increasing values of repayment factor and productivity factor of production function.

5.4. Empirical Analysis

It has been emphasized that the income of the families living in rural areas of the developing countries are quite volatile showing high values of coefficient of variation. The families in these areas face various types of risks (yield risk, price risk, and weather risk) and uncertainties (illness, cattle loss etc.), as evident from Table 5.2.

Table 5.2: Percentage of Families Facing Various Risk and Uncertainties

Variable	Mean Value: China	Mean Value : India
Price Risk	.07	.06
Yield Risk	.06	.10
Weather Risk	.05	.09
Suffered Crop Loss, Cattle Loss	.70	.90
Suffered Death or Major Sickness in Family	.68	.91

One of the fallout of these risks is that large percentage of families particularly belonging to lower assets quintiles are not able to smooth food consumption throughout the year as reported in Table 5.3. This finding in conjunction with Result 5.1 provides evidence of imperfect credit market in these areas.

Table 5.3: Percentage of Families Unable to Get Adequate Food throughout the Year

Quintile :Assets (N)	*Quintile 1*	*Quintile 2*	*Quintile 3*	*Quintile 4*	*Quintile 5*	*Total*
Food Scarcity: India	.65 (101)	.63 (60)	.50 (79)	.43 (88)	.38 (72)	.52 (400)
Food Scarcity: China	.22 (132)	.31 (74)	.20 (237)	.21 (122)	.16 (190)	.21 (755)

To mitigate these risks, these families adopt various ex ante and ex post risk management options – some of these are summarized in Table 5.4.

Table 5.4: Risk Management Options

Risk Management Options (scale : 1-5)	Mean. : India (N=400)	Mean. : China (N=1200)
Crops/ animal/ enterprise Diversification	3.94	3.95
Geographic diversification of plots	3.53	3.42
Irrigation	4.24	4.25
Spreading of sale of crops	3.03	3.45
Forward contracts of crops	2.84	3.45
Government Programs	3.23	3.89
Financial Reserves	3.67	3.70
Off farm income	3.59	3.99

One ex post mechanism is to borrow to meet the expenses requirements. In both the countries almost 25 percent of the borrowings seem to be done for such purposes.

To smooth their consumption and satisfy other needs they usually take recourse to - (a) borrow from formal credit market, (b) do precautionary savings, (c) enter into mutual risk sharing arrangements, and (d) depend on informal borrowing from friends and relatives. In the foregoing sections precautionary savings, risk sharing insurance mechanisms and risk sharing credit transactions mechanisms have been analyzed.

The issues related with credit rationing have been investigated in the previous chapter. Here empirical strategies are developed to infer the significance of precautionary savings and importance of risk sharing insurance and credit arrangements, using the household survey data from China and India.

4.2 Precautionary Savings

Result 5.3 asserts that a prudent household saves more in the face of uncertain prospects of income. In this section it will be tested econometrically. Table 5.5 presents the saving behavior of the households. In the case of China about 50 percent of the households are not able to save anything, whereas in the case of India this percentage is 28.50. Also only about 30 percent families in both the countries are found to be saving more than 5 percent.

Table 5.5: Saving Behavior of Families

Proportion of Household income saved in a year	China		India	
	Freq.	Percent	Freq.	Percent
(No saving)	367	48.61	114	28.50
less than 5%	147	19.47	176	44.00
between 5 and 10%	93	12.32	94	23.50
More than 10% (High saving)	148	19.60	16	4.00
Total	755	100.00	400	100.00

Further Table 5.6 describes the response of the households related to change in savings in response to reduction in uncertainty in their income. About 50 percent of the households in both the countries want to reduce saving – indirectly it corroborates to the findings of the Result 3 that large numbers of families are engaged in precautionary savings. Also about 40 percent of the households in China (about 50 percent for India) intend to save more – implying that these households attach high importance to savings and they do not desire to reduce saving even if the uncertainty in their income process is reduced.

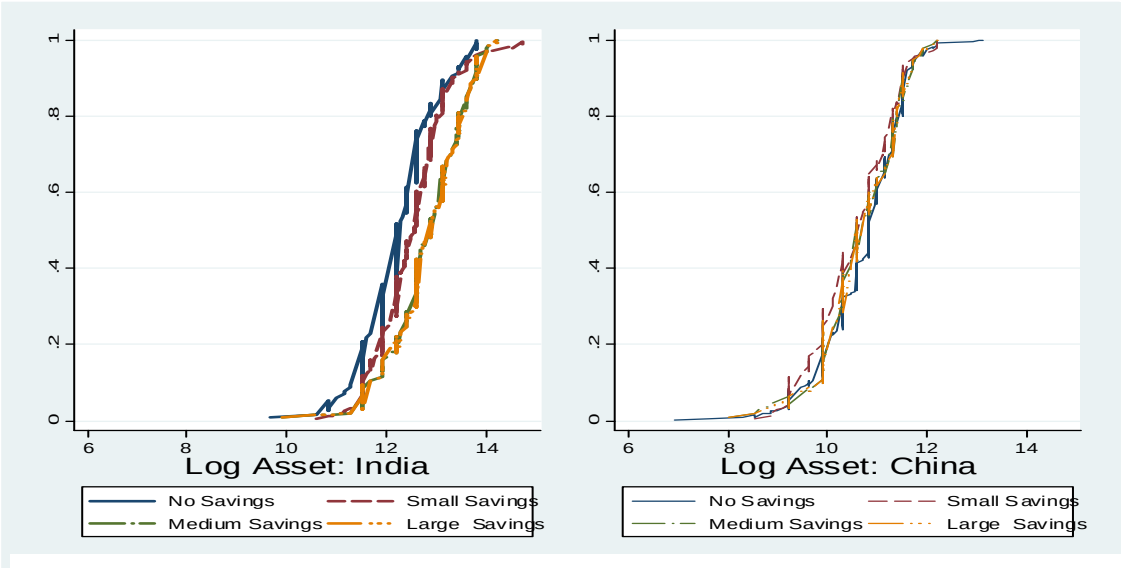
Table 5.6: Change in Savings in Response to Reduction in Uncertainty in Income

Response to savings, if there is a significant reduction in uncertainty in income	Variable Remark	China		India	
		Freq.	Percent	Freq.	Percent
Decrease savings and increase investment	Precautionary savings	288	38.30	152	38.00
Decrease savings and increase purchases		91	12.10	32	8.00
Decrease savings and increase travel/vacations		10	1.33	3	0.75
Maintain the same amount of savings		50	6.65	18	4.50
Increase savings slightly	Increase savings	158	21.01	135	33.75
Increase savings a lot		155	20.61	60	15.00
Total		752	100.00	400	100

5.4.3 Empirical Analysis of Saving and Precautionary Savings

There is a huge literature on analytics and empirics of savings[34]. However here savings and its' determinants is discussed in the backdrop of its use mainly as risk mitigation tool by families in these areas. Savings is hypothesized to be driven by mainly life cycle motives and precautionary motives. In cross section data it is difficult to identify and isolate the motives of savings mainly because of measurement issues, risk heterogeneity, time preference heterogeneity, and adjustment in consumption related to income shocks actually require dynamic data.

Before proposing any econometric model, the natures of association of savings and household income have been shown by the graphs in Figure 5.5 for India and China. These are cumulative density functions (CDFs) of log of income for different saving rates. Evidently the CDF related to higher saving rates are dominating (second order) the CDF of lower saving rates. Thus household savings seems to be positively associated with household income.



Figures 5.5: Cumulative Density Functions of log assets for different saving rates.

[34] Horioka and Watanabe (1997), Deaton (1993), and Lim and Townsend (1998), Browning and Luscardi (1996), Carroll and Samwick (1995) are good references.

4.3.1 An Econometric Model of Savings and Identification Strategy

In the present survey, the savings are measured on ordinal scale. Families with zero savings are placed in group 1, with less than 5% savings in group 2, between 5% and 10% in group 3, and above 10% in group 4.

Such type of response assumes that the observed saving groupings are related to an underlying latent continuous variable. The range of this latent continuous variable is divided by a number of threshold values representing the ordinal responses. The latent continuous variable s* is expressed as a linear combination of explanatory variables and normally distributed error term.

$$s^* = X\beta + \varepsilon; \qquad \text{where } \varepsilon \approx N(0,1) \qquad ...(5.26)$$

The observed saving variable s takes on values from 0 to k as following

$s_i = j$, iff $\mu_{j-1} < s^* < \mu_j$; where i = 1,..., N (number of observations) and j = 0,.., k

μ_js are threshold values. Hence $s_i = \begin{cases} 0 \text{ if } \text{ if } s_i^* \le \mu_0 \\ 1 \text{ if } \mu_0 < s_i^* \le \mu_1 \\ 2 \text{ if } \mu_1 < s_i^* \le \mu_2 \\ 3 \text{ if } \mu_2 \le s_i^* \end{cases}$

The central question here is that how changes in explanatory variables influence the probability of observing a particular ordinal response.

$\text{Prob}(s_i = 0) = P(s_i^* \le 0) = P(X\beta + \varepsilon \le \mu_0) = P(\varepsilon \le \mu_0 - X\beta) = \Phi(\mu_0 - X\beta)$

$\text{Prob}(s_i = 1) = P(0 < s_i^* \le \mu_1) = P(\mu_0 < X\beta + \varepsilon \le \mu_1) = P(\mu_0 - X\beta < \varepsilon \le \mu_1 - X\beta)$

$\Rightarrow \text{Prob}(s_i = 1) = \Phi(\mu_1 - X\beta) - \Phi(\mu_0 - X\beta)$

$\text{Prob}(s_i = 2) = \Phi(\mu_2 - X\beta) - \Phi(\mu_1 - X\beta)$ and $\text{Prob}(s_i = 3) = 1 - \Phi(\mu_2 - X\beta)$

Maximum likelihood method is used to estimate this model. For that log-likelihood function is defined as following.

$$\log L = \sum_{i=1}^{i=N} \sum_{j=0}^{j=k} Z_{ij} \log(P_{ij}) \text{ ; where } Z_{ij} = 1 \text{ if family i chooses option j, and zero otherwise .} (5.27)$$

The parameters β and μ are identified by assuming , $\mu_0 = 0$, and $\text{var}(\varepsilon) = \sigma^2 = 1$.

Then equation (5.27) is estimated using ordered probit model. As discussed earlier, it is not empirically possible to isolate the various motives that influence saving behaviors in cross section data. Hence the variables compatible with both life-cycle hypothesis and precautionary motives will be used as explanatory variables. As per life cycle hypothesis (Modigliani and Brumberg, 1953) savings (dissavings) are done to smooth consumption as yearly income varies. So income is used as an explanatory variable. Also savings vary in quadratic fashion with respect to age – saving is peaked at middle age. According to assets based theories of savings (Tobin, 1951, Houthakker and Taylor, 1970) savings is positive when wealth falls below the family's optimal level of wealth. As data on optimal wealth is not available, household assets are used as a control variable. According to precautionary motives (Leland, 1968 and Sandmo, 1970) families save to meet the urgencies arising out of uncertainties in income process, hence perceived variance in income is used to control for this. Also family size, education, and magnitude of credit constrainedness are used as other explanatory variables as these variables also affect savings according to above said theories. Also according to equations (5.13) and (5.15) savings is a function of income, wealth, uncertainty in income (variance), interest rate and discount rates. These variables are reasonably exogenous. Only doubt may arise on exogeneity of wealth as this may depend on savings. But here saving is measured as percentage of annual income and assets are measured mainly in terms of house, land etc. which are long time durable and the markets for these assets are quite illiquid, hence the savings can not be easily transformed into assets, and so assets is satisfactorily exogenous here. Table 5.7 reports the summary statistics of these variables.

Table 5.7: Summary Statistics of Important Variables

Variable	India		China	
	Mean (N=384)	Std. Dev.	Mean (N=756)	Std. Dev.
Sex (1=female)			0.10	0.31
Saving (0-3)	1.02	0.82	1.03	1.18
Log income	10.51	0.64	9.02	0.84
Log asset	12.55	0.79	10.50	0.95
Log income std.dev.	9.03	1.27	6.83	1.43
Age	47.58	11.58	3.75	5.98
Percentage of farm income	56.50	25.76	47.13	33.90
Household size	6.58	3.31	4.41	1.57
Education (1-4)	2.53	0.82	2.39	0.78
Major sickness (1=yes)	0.38	0.48	0.20	0.40
Buy crop insurance (1=yes)	0.34	0.48	0.17	0.38
Abs. risk aversion coeff. $*10^{-3}$	0.11	0.17	1.49	2.88
Want to increase saving (1=yes)	0.49	0.50	0.41	0.49
Risk prone (1=yes)	0.98	0.13	0.77	0.42
Credit constrainedness (0-1)	0.65	0.24	0.57	0.13

Note: Age groupings in the case of China: 20-30 years=1, 30-40 years=2, 40-50 years=3, above 50 years =4

Risk prone families are identified as those who have suffered crop or livestock loss, major illness or death of a family member in previous year. Absolute risk aversion coefficient is approximately computed based on Binswanger (1981) question, discussed latter.

The equation (5.27) is estimated using ordered probit model. The results are reported in table 5.8. The coefficients have no marginal effects interpretations. A significantly positive (negative) coefficient of a variable indicates that higher values of that variable are associated with bigger probability of being in higher (lower) saving group.

Table 5.8: Ordered probit Estimation of Savings

Dependent Variable	India		China	
Saving (0,1,2,3)	Coef.	Z	Coef.	Z
Sex (1=Female)			0.193	0.78
Log income	1.281*	5.19	0.481*	3.5
Log asset	0.414*	1.98	0.036	0.27
Log standard deviation income	-0.294*	-2.15	0.024	0.39
Percent Farm Income	0.026*	4.15	0.003	0.8
Age	-.008	-.14	-1.258*	-2.48
Age square	0.000	-0.26	0.188*	2.04
Household Size	0.050	1.26	-0.020	-0.38
Education	-0.044	-0.29	0.219*	2.09
Sickness (1=yes)	-0.592*	-2.41	-0.406*	-2.03
Buy crop insurance (1=yes)	-0.204	-0.83	0.740*	3.9
Absolute risk aversion coeff	1.830*	2.41	0.070	1.04
Increase savings	0.686*	2.75	0.489*	3.05
Risk prone (1=yes)	0.181	0.22	0.024	0.13
Credit Constrainedness	-1.764*	-2.67	-2.455*	-2.94
/cut1 : μ_1	14.649*	4.68	2.643	1.41
/cut2 : μ_2	17.245*	5.44	3.561*	1.75
/cut3: μ_3	19.766*	6.15	4.313*	2.2

India: N = 384; LR chi2(16) = 151.47; Log likelihood = -377.73694; Pseudo R2 = 0.1670
China: N= 642; LR chi2 (16) = 96.76; Log likelihood = -741.0395; Pseudo R2= 0.062

Important findings from this estimation are discussed as following:

1. The coefficients on the income and assets are positive. The families with higher income and assets save more, as predicted by life cycle hypothesis and assets based theories.

2. The coefficient on the family size is not significantly negative as per the conjecture. Theoretically larger family size is associated with lower probability of higher savings, as bigger the family size is more the consumption needs are and less the savings are.

3. The coefficients on the age and age square are not as per the conjecture. In the case of China it is actually other way. Apparently savings starts increasing beyond a threshold age in China as earning prospects get better with increasing age and the families may be saving for bequest purpose.

4. The coefficient on the sickness is negative. Apparently if there is a major sickness in family, then prospects of savings decreases, the families may be actually dissaving.

5. When the families buy crop insurance, then as per the precautionary motives, the savings should be reduced. In the case of India, the sign on the variable is right but not significant and in the case of China it is actually significantly positive. Apparently the families save not only to fend from crop losses but also from other urgencies.

6. The coefficient on the absolute risk aversion coefficient is positive (also significant in the case of India) implying that the families who are more risk averse tend to save more. In a way it supports the precautionary motives.

7. The coefficient of the "Increase savings" variable is significantly positive, implying that the families who attach high importance to savings actually save more.

8. The coefficient on the log of standard deviation income is not significantly positive as per the conjecture of precautionary motives – more uncertainty in income leads to more savings. On reason for this can be that it is actually perceived variance in income as believed by the families and not actual variance in income. Another reason may be that even if the families want to save more they may not be able to do that and then they may be depending on post facto borrowing from informal or formal sources.

9. In the data the families are identified risk prone based on certain features (such as, families suffered crop loss, cattle loss etc., suffered death, major sickness of a family member); as per precautionary motives these families should save more. In the result we get the right sign but the coefficients are not significant.

10. The coefficient on the credit constraint variable is significantly negative. Apparently more credit constrained families are able to save less.

11. The threshold parameters are significantly positive, that validates the ordering of saving rates in data and appropriateness of ordered probit estimation method.

Further the change in likelihood of being in various saving groups with increasing income has been shown in Figure 5.6. Evidently with increasing income the probability of no savings and small savings decreases and probability of medium savings and large savings increases. Overall we get evidence of life cycle and precautionary motives for savings and so also for the Result 5.3. However some of the coefficients are not as per conjecture; one reason may be that many families are unable to save as much as they wish and post facto they may resort to borrowing from informal and formal sources.

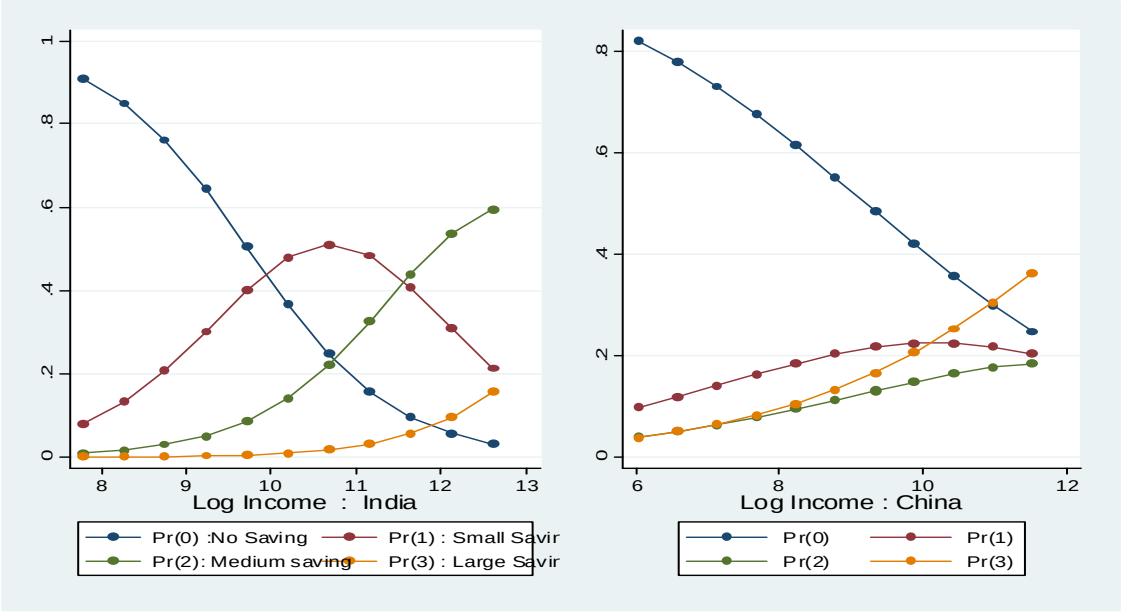


Figure 5.6: Change in Likelihood of being in Various Saving Groups with Increasing Income (India and China respectively)

5.4.2 Estimation of Willingness to Pay Premium for Insurance Coverage

Result 2 describes the risk premium as the minimum amount which a risk averse agent is willing to pay to avoid fluctuations in her consumption across dates. This can be estimated using the equation (5.11), which requires the values of coefficient of relative

risk aversion. Using cross section data, it is difficult to estimate the risk preference parameters of people mainly because of non separation of utility maximization and profit maximization decisions of the households in an incomplete market setting[35]. However, using a survey question related to Binswanger (1981) experiment and also using approximations as suggested in Anderson and Dillon (1992) and Hardaker et al (2004), the coefficient of relative risk aversion of the people are computed. It is acknowledged that this way of measuring relative risk aversion coefficient may not be rigorous, however for the limited purpose of estimating risk premium of the households this may be adequate. Table 5.9 reports the frequency distribution of the families belonging to different levels of relative risk aversion coefficient.

Table 5.9: Frequency Distribution of Families for Coefficient of Relative Risk Aversion

Coefficient of	India			China		
Relative risk aversion (r.r.)	Freq.	Percent	Cum.	Freq.	Percent	Cum.
Risk Neutral : 0	63	15.79	15.79	137	12.06	12.06
Low Risk Averse: 0.5	36	9.02	24.81	57	5.02	17.08
Moderate Risk Averse: 1	66	16.54	41.35	88	7.75	24.82
High Risk Averse: 2	73	18.3	59.65	143	12.59	37.41
Severe Risk Averse: 3	57	14.29	73.93	101	8.89	46.3
Excessive Risk Averse: 4	104	26.07	100	610	53.7	100
Total	399	100		1,136	100	

Further, the natures of association of risk aversion and household assets have been shown by the graphs depicting cumulative density functions (CDFs) of log of asset for different level of risk aversions in Figure 5.7 respectively for India and China. Evidently the CDF related to lower level of risk aversions dominate the CDF of higher

[35] Followed from Prof. Just, David (2008) class note for AEM 702 course , available on http://summer.blackboard.cornell.edu/courses/1/AEM702-Just - spring2008/content/_1021457_1/RiskNotesPartV.pdf

level of risk aversions. Thus level of risk aversions of household seems to be negatively associated with household assets.

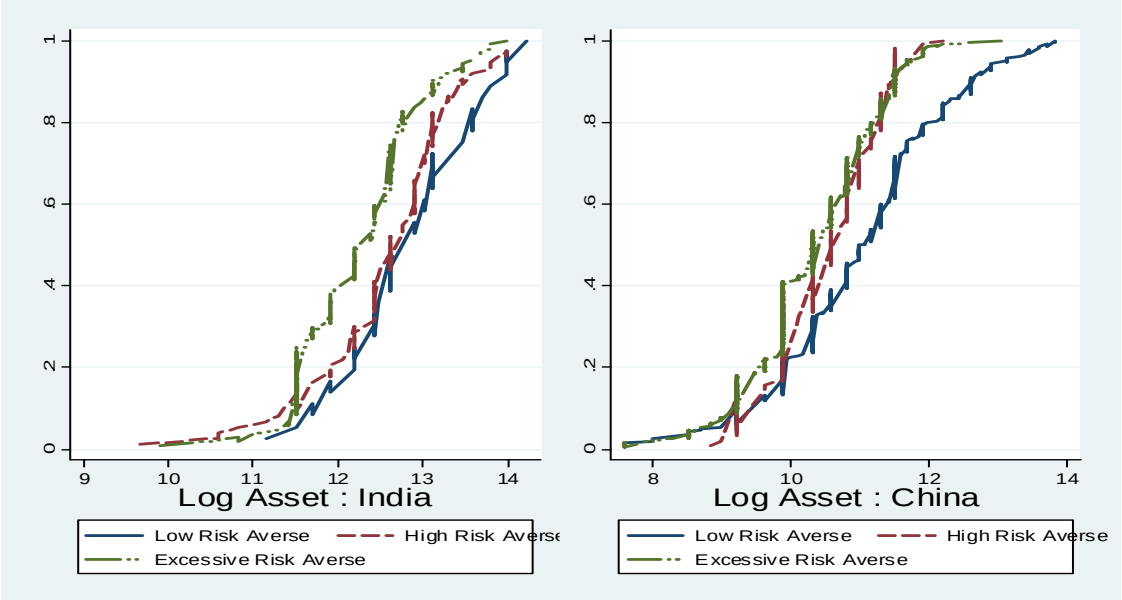


Figure 5.7: Cumulative Density Functions of Log Assets for Different Levels of Risk Aversion

Furthermore, even no analytical framework has been developed here to understand the determinants of the coefficient of relative risk aversion of the families; we have tried to learn that using Ordered Probit regression method. This method has been used because of the ordinal nature of the dependent variable – as explained before where the empirics of precautionary savings are studied. The estimation results are reported in Table 5.10. Apparently higher level of household assets, income, and education level are associated with lower level of risk aversion. Also the level of risk aversion seems to be increasing with age of the respondent.

Table 5.10: Ordered Probit Estimations of Coefficient of Relative Risk Aversion

Dependent variable:	India		China	
Coeff. Of Relative Risk Aversion	Coef.	z	Coef.	z
Age	0.01	0.19	0.19*	2.68
Household Size	-0.01	-0.44	-0.03	-0.91
Education	-0.10	-0.77	-0.11	-1.22
Log asset	-0.28*	-2	-0.07	-0.77
Log income	-0.36*	-1.92	-0.11	-1.02
Income Source (Farm=1, yes)	-0.26	-0.98	0.10	0.68
region6	-0.84*	-2.85		
region8	-0.15	-0.5		
region9	-0.90*	-3.3	-0.28*	-1.96

India : N = 399; LR chi2(10) = 48.80; Prob > chi2 = 0.00; Pseudo R2 = 0.04
China : N = 731; LR chi2(10) = 23.28; Prob > chi2 = 0.00; Pseudo R2 = 0.01

Using the survey data from China and India, the magnitude of the proportionate risk premium is computed and reported in Table 5.11. The mean farm income and standard deviation of the farm incomes have been computed based upon the farmer's responses on the questions related to their expectations on prices and yields of the five important crops. Then coefficient of variations of farm income is computed. The proportional risk premium is computed in two ways. First, it is computed assuming the value of coefficient of relative risk aversion equal to two for everyone. Secondly the proportional risk premium values are computed by using the values of coefficient of relative risk aversion (r.r.) as explained earlier. The values of coefficient of variation of income and that of proportional risk premium seem to be reasonable and no trend is apparent across the asset quintiles. However the coefficient of relative risk aversion seems to be decreasing with higher level of quintiles of assets. Also the values of risk premium are found to be marginally higher in the case of India.

This demonstrates that risk is a major concern for rural people and they are willing to pay for insurance coverage is as high as 15- 20 percent of annual income.

Table 5.11: Values of Proportional Risk Premium for Rural Families in China and India

Asset Quintiles **China**	N	Family income (RMB)	Mean farm income (computed) (RMB)	S.d. of income (computed) (RMB)	Coeff. of Variation of income (computed)	Prop. Risk Prem., assuming r.r.=2	Coeff. Of Relative Risk Aversion	Prop. Risk Premium , assuming , variable r.r.
1	453	7441.47	3885.35	1263.25	0.32	0.13	2.98	0.16
2	181	9276.33	5173.88	1736.05	0.34	0.14	2.57	0.15
3	263	11770.7	10302.54	3735.72	0.32	0.13	2.67	0.15
4	243	13348.2	9818.78	4010.93	0.32	0.13	2.82	0.17
5	245	17324.4	13679.87	5615.34	0.34	0.13	2.54	0.16
Total	1385	11274.9	8033.25	3041.05	0.33	0.13	2.77	0.16

Asset Quintiles **India**	N	Family income (Rs.)	Mean farm income (computed) (Rs.)	S.d. of income (computed) (Rs.)	Coeff. of Variation of income (computed)	Prop. Risk Prem., assuming r.r.=2	Coeff. Of Relative Risk Aversion	Prop. Risk Premium, assuming, variable r.r.
1	101	29954.5	15653.6	7295.2	0.38	0.17	2.45	0.19
2	60	33083.3	22401.6	10064.5	0.36	0.16	2.12	0.12
3	79	42063.3	51617.7	20725.9	0.36	0.15	2.1	0.14
4	88	50619.3	47685	25989.2	0.37	0.16	1.93	0.15
5	72	7597.22	105196	52236.6	0.43	0.21	1.51	0.16
Total	400	45577.3	46933.2	22565.3	0.38	0.17	2.05	0.16

5.4.3 Informal Lending and Borrowing: Risk Sharing Motive

Result 5.5 asserts that introducing a loan element in the process of risk sharing, enables the process to sustain with more impatient agents. Money gifts and informal loan transactions among friends and relatives are important ways of risk sharing.

It has been highlighted in the introduction that; i) large percentage of people depends on informal loans for their credit needs, almost 50 percent in India and 70 percent in China; (ii) informal loans constitute substantial part of total loan portfolios, almost 40

percent in India and 60 percent in China, particularly for families belonging to lower quintiles of assets. Further the data reveals that in both the countries more than 70 percent families and 90 percent families have engaged in gift transactions and loan transactions respectively in emergencies. This demonstrates that people do share risk on a large scale and moreover preference for loan transaction dominates. These findings give credence to Result 4 and Result 5. Also more than 80 percent families do not prefer to default on such loans and further almost same percentage of families agree that community pressure helps in reducing defaults on such loans. These finding give credence to Result 5.6.

Table 5.12 reports various key aspects of gifts and credit transactions among the friends and relatives. Evidently preferences for loan transactions are much higher than for gifts transactions in both countries. In emergency situations gifts transactions take place on a large scale, although the loan transactions dominate. Also major fractions of families prefer loan transactions in both normal and emergency conditions. Large fractions of families also agree that community pressure helps in reducing defaults.

Table 5.12: Important Aspects of Informal Financial Transactions among Friends or Relatives

Variable (mean value shows the fraction of respondents who agree to the question: 1=yes)	Mean Value : India (N=400)	Mean Value: China (N=739)
Gift transactions among friends and relatives	.67	.25
Gift transactions(stronger version: both gave and received)	.36	.05
Loan transactions among friends and relatives	.97	.94
Loan transactions(stronger version: both lent and borrowed)	.60	.70
Gift for emergency purposes	.71	.59
Loan for emergency purposes	.96	.98
Prefer loan for emergency purposes	.88	.82
Prefer loan for general purposes	.73	.84
Prefer not to default on such loans	.80	.93
Community pressure helps in reducing default	.76	.63

Further important motivations for such financial transactions are reported in Table 5.13. Evidently large percentage of families prefer to borrow (lend) from friends and relatives. Substantial percentages of families find this convenient and also loan and interest repayment terms are found to be flexible. Considerable percentages of families do such financial transactions as they trust that loans will be repaid. But also a good percentage of families agree to give loans even they do not trust that loan will be repaid and also a good percentage of families agree to borrow or lend even they have been refused earlier by their friend and relatives.

Table 5.13: Important Motivations of Financial Transactions among Friends or Relatives

Variable (mean value shows the fraction of respondents who agree to the question: 1=yes)	Mean Value : India (N=400)	Mean Value: China (N=739)
Prefer to borrow from friends or relatives	.50	.72
Flexibility in loan repayment	.87	.93
Flexibility in interest amount repayment	.83	.76
Borrowing from friends or relatives convenient	.89	.96
Trust that loans given to friends or relatives will be repaid	.79	.90
Loans given even not trust that loan will be repaid	.45	.63
Agree to borrow or lend even they have refused earlier	.27	.52

These findings clearly highlight the importance of informal financial transactions (gifts and loans) for the risk sharing purpose.

Using the framework of collective utility maximization of the participating agents in risk sharing, the equations (5.23), (5.24) and (5.25) are obtained which determine the risk sharing loan amount and repayment rate. The Result 5.6 summarizes the findings - the loan amount decreases with increasing uncertainty in income and production process and also with increasing risk aversion of the agents. It increases with increasing values of repayment factor and productivity factor of production function.

5.4.3.1 An Econometric Model of Informal Borrowing and Identification Strategy

Ideally to empirically test the findings of Result 6, we need the observations on amounts of loan transactions a household makes with his friends and relatives repeated over a certain period of time. Also we need data on variance of income over this period and also a reliable estimate of absolute risk aversion coefficient. Furthermore, repayment rates of these informal loans in different states need to be known.

But it is very arduous and time consuming to get hold of such an ideal data set. The present data set has information for only one year. It has information on total outstanding informal loan amount for each family and we do not have data on pair wise loan transactions. Furthermore the income variance and absolute risk aversion coefficient have been measured, based on responses of the families to a specific set of questions that may not be quite rigorous. However, we can still obtain satisfactory inferences on result 5.6, if the explanatory variables are satisfactorily exogenous.

Basically the following equation is estimated using OLS regression method.

$$\text{Log Informal Loan} = \beta X + \gamma Z + \varepsilon \quad : \varepsilon \sim N(0, \sigma^2) \qquad ...(5.28)$$

Where, X= explanatory variables such as, absolute risk aversion coefficient, coefficient of variation of income (for uncertainty in income process), repayment rate.

Z= Control Variables such as, household asset, education, household size, credit constrainedness of the family, preferences for borrowing from friends and relatives – convenience and flexibility.

The absolute risk aversion coefficient is computed using the values of the relative risk aversion coefficient, dividing it by the household asset. We have no data on the repayment rates on the risk sharing informal loans, hence we are using a related variable – delay or default in repayment of informal loans as a proxy for repayment rates. This is the best we can do here. For consistent estimate of the coefficients, it is

necessary that the right hand variables are exogenous. This requirement seems to be satisfied here. The credit constrained status of a family is realistically an explained variable, hence the predicted value of credit constraints (obtained from first stage regression of credit constraints on a set of explanatory variables; discussed in Chapter 3) is used in the regression. Further, in the cross section data, we are not able to control for the unobserved heterogeneities of the people, this may induce some bias in the coefficients; this weakness of the proposed estimation is acknowledged here. The OLS estimation results are reported in Table 5.14.

Table 5.14: OLS Results of Log Informal Loan

Dependent Variable :Log informal Loan	India		China	
	Coef.	t	Coef.	t
Absolute risk aversion coefficient	-2.03*	-2.47	-0.29*	-3.2
Coefficient of variation of income	0.61	0.77	-1.97*	-2.54
Delay or default in repayment	1.75*	6.93	0.99*	4.6
Education	0.03	0.18	-0.02	-0.13
Log asset	-0.04	-0.18	0.27	1.58
Household size	0.01	0.15	0.05	0.7
Predicted value of credit constraint	-0.31	-0.47	5.41*	4.82
Borrowing from Friend and relative convenient	1.97*	4.92	0.36	0.63
Flexible repayment terms (1=yes)	0.14	0.42	0.65*	2.07
region6	1.45*	3.4		
region8	0.69*	1.79		
region9	1.23*	3.68	-1.43*	-5.05
_cons	3.13	1.18	1.31	0.61

India : N = 305; F(12, 292) = 8.95; Prob > F = 0.00; Adj R-squared = 0.24
China : N = 344; F(10, 292) = 9.95; Prob > F = 0.00; Adj R-squared = 0.20

Important inferences of this estimation are mentioned as following:

1. Regression results for both the countries are quite significant, as F statistics are quite satisfactory and R squared values are quite high.
2. In both the estimations the absolute risk aversion coefficient is found to be significantly and negatively associated with the informal loan amount. This is as per the conjectures of result 5.6.

3. In the case of China, the coefficient of variation of income is found to be significantly and negatively associated with the informal loan amount, which supports the assertions of result 5.6. However, in the case of India no significant result is obtained.
4. However, in both the estimations the delay or default on loan repayment is found to be significantly and positively associated with the informal loan amount, which is against the conjectures of result 5.6. It may be happening for two reasons. One, this variable may not be a good proxy for repayment rates. Two, the delay and to some extent the default on informal loan repayments also demonstrate the flexibility of such loans related to schedule of repayments and that may actually encourage more informal borrowing.
5. No significant relations are found for the household asset in these regressions. In the case of China, the credit constraints in the formal markets is found to be significantly and positively associated with the informal loan amount. This finding is as per the conjecture that the families who are credit constrained are compelled to depend on informal loans.
6. Further the convenient aspect of informal borrowing and flexibility aspect of such borrowing are also found to be positively associated with the informal loan amount. These findings are also as per the conjecture that many families prefer to borrow from the friends and relatives.

Overall we obtain the inferences that broadly support the findings of result 5.6 - the informal loan amount decreases with increasing uncertainty in income and production process and also with increasing risk aversion of the agents. However, we could not get supporting inferences for positive association of informal loan amount with repayment factor.

5.5. Conclusion

Majority of the families living in rural areas of the developing countries are exposed to income process which is quite volatile showing high values of coefficient of variation. The families in these areas face various types of risks and uncertainties as shown here. In absence of well functioning credit and insurance markets, consumption smoothing is a big challenge for these families and they resort to various ex ante and ex post measures to smooth their consumptions. To smooth their consumption and satisfy other needs they usually take recourse to - (a) borrow from formal credit market, (b) do precautionary savings, (c) enter into mutual risk sharing arrangements, and (d) depend on informal borrowing from friends and relatives.

This chapter's main objective is to present a detail analytics of risk sharing and consumption smoothing motives of risk averse agents. Further we have investigated into the matters related with various ways of insuring against risk. The three important mechanisms analyzed are; precautionary savings, risk sharing insurance and credit arrangements. Useful results are obtained which attempt to explain these mechanisms. The household survey data from China and India are used to conduct empirical investigation into the significance of the important results obtained here. Suitable econometric methods and appropriate identification strategies have been proposed to get evidences on the results related to precautionary savings, risk sharing insurance arrangements and risk sharing credit arrangements.

An estimate of coefficient of relative risk aversion and coefficient of absolute risk aversion are needed to measure the risk premium and optimal informal loan amount. Risk premium is defined as the minimum amount which a risk averse agent is willing to pay to avoid fluctuations in her consumption across dates. The coefficients of relative risk aversion of the people have been estimated using a survey question related to Binswanger (1981) experiment and also using further approximations. It is

acknowledged that this way of measuring relative risk aversion coefficient may not be rigorous, however for the limited purpose of estimating risk premium of the households this may be adequate. Apparently higher level of household assets, income, and education level are associated with lower level of risk aversion. Also the level of risk aversion seems to be increasing with age of the respondent.

Using the survey data from China and India, the magnitude of the proportionate risk premium is computed which is found to be in the range of 15-20 percent. This demonstrates that risk is a major concern for rural people and they are willing to pay for insurance coverage as high as 15- 20 percent of annual income.

Satisfactory evidences of life cycle and precautionary motives for savings are obtained. Higher level of household assets and income are found to be positively associated with the savings. Also higher values of absolute risk aversion are found to be positively associated with the savings. It is also observed that a large number of families are not able to save but they seem to attach high importance to the savings.

Also significant evidences are obtained related to risk sharing insurance arrangements risk sharing credit arrangements. It has been observed that in both the countries more than 70 percent families and 90 percent families have engaged in gift transactions and loan transactions respectively in emergencies. This demonstrates that people do share risk on a large scale and moreover preference for loan transaction dominates.

Further the empirical investigation suggests that the informal loan amount decreases with increasing uncertainty in income process and also with increasing risk aversion of the agents. However, we could not get supporting inferences for positive association of informal loan amount with repayment factor.

Some of the weaknesses of the estimations are as following:

1. The coefficients of relative risk aversion and absolute risk aversion of the families are measured approximately. Rigorous estimations of these coefficients using

repeated observations on the choices made by the families related to consumption and production activities (Bar-Shira et.al., 1997) may improve the inferences on the results.

2. The variability of the income of the households is also measured based on the perceptions of the families. Here also using repeated observations on income, may give better measurement of the variance of households' income.
3. Also in a cross section data, we are not able to control for the unobserved heterogeneities of the households. The availability of panel data may resolve the omitted variable bias caused by this inadequacy.

All the same this chapter provides helpful insights on risk sharing and consumption smoothing motivations and mechanisms of the families living in the rural areas of developing economies.

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Chapter 6: The Economics of Informal Lending and Risk Sharing Motive

In the rural areas of developing countries informal lending and borrowing among friends and relatives are observed to be quite prevalent. The main objective of this chapter is to analyze the significance and underlying motives of such informal financial transactions. In the literature risk sharing motive has been advanced as an important explanation of these informal financial transactions. Pursuing that line of research, a detailed analysis of risk sharing motive for informal financial transactions has been presented, and useful results are obtained. The primary contribution of this chapter is to characterize the loan amount, state contingent repayments, and default rates in equilibrium. Also a simple test is suggested in the chapter to get inferences on risk sharing motives. Further, these results are empirically tested using household survey data from China and India. Significant evidences are obtained related to risk sharing motives explaining the informal lending and borrowing.

6.1. Introduction

In the developing countries particularly in the rural areas people face severe challenges in arranging finance for consumption and production purposes. The standard assumptions of complete markets including that of credit and insurance markets generally do not hold well in reality. The price mechanism particularly in credit and insurance market is intrinsically limited by transaction costs and information and enforcement costs[36]. Consequently fulfillment of effective demand of credit and insurance is not attained. In response to these imperfections, several institutional mechanism have developed in these areas such as, sharecropping (Cheung 1969, Stiglitz 1974), informal lending and insurance arrangements (Udry 1994, Coate,

[36] See Hoff, Braverman, and Stiglitz (1993) for more on this.

S. and Ravallion, M. 1993, Eswaran and Kotwal 1989, Ligon, Thomas, and Worrall 2002) etc.

The vigorous coexistence of formal and informal credit market in rural areas is well documented[37]. The commercial banks and rural cooperatives predominantly constitute formal credit institutions that usually mobilize savings and advance loans. They advance loans mainly for productive usages at low interest rates, but also they insist on collaterals, which poor families are often unable to post. In the informal credit markets, money is lent by private individuals – moneylenders, traders, landlords, friends, relatives etc. The loan contracts are quite diverse in nature. Moneylenders generally advance credits at high interest rates, the traders and landlords advance loans at low rate of interests in lieu of reciprocal services to be rendered to them, and friends and relatives advance credits at low interest rates as a mutual support and insurance arrangements.

The main objective of this chapter is to develop an analytical framework to investigate the underlying motives for such financial transactions among friends and relatives in the rural areas of developing countries, and also to empirically test some of the results obtained from this analysis.

This study is important for following reasons:

(i) The families in these areas mostly depend on agriculture and ancillary activities. The household survey data from China and India reveals that farm income constitutes about 48 and 57 percent of family income respectively in China and India. The coefficient of variation of farm income in these countries are usually high, it is estimated around 34 percent. This creates substantial uncertainties in their income. So insurance and credit becomes an important

[37] See Bell (1990) for a good reference.

input for livelihood for most of the families. Families need credit for consumption, production, and other investment purposes.

(ii) Further formal credit markets - banks and rural credit cooperatives (RCC) are not well developed in such areas. In these areas informal borrowing constitutes a large portion of total borrowing. The Data reveals that informal borrowing constitutes about 64 and 37 percent of total borrowing respectively in the case of China and India.

(iii) So also the insurance markets are not well functional in these areas. For example, in the case of India 90 percent families show their willingness to buy crop insurance, whereas only 34 percent families have actually bought this, in the case of China these percentages are 75 and 18 respectively. In absence of well functioning insurance markets, the importance of credit is further enhanced (Eswaran and Kotwal, 1989).

(iv) Also the data reveals that large percentages (50 percent) of the families actually prefer informal loans to formal loans.

Household surveys were conducted in rural areas of China (in years 2007 and 2008) and India (in year 2008-09). About 1200 families in China and 400 families in India were surveyed. The survey questionnaires are designed to elicit responses of families related to; (i) credit rationing problems which they face, (ii) how it affects their livelihood choices, (iii) how they respond to overcome this problem, and (iv) the extent, types and motives for financial transactions among friends and relatives. The surveys data are used in this chapter to analyze the informal lending results.

Some initial findings are mentioned here that considerably motivates this chapter.

1. About 45 percent families in India and 30 percent families in China have been denied loan from RCC or banks, because of various reasons as summarized in Table 6.1. Evidently lack of collateral seems to be major reason for denial of loan.

Table 6.1: Reason for Denial of Loan from RCC or Bank

Variable : Denied loan due to	Mean: India (N=180)	Mean : China (N=524)
Lack of collateral (1=yes)	.50	.65
Yield risk in crop (1=yes)	.1	.04
Fail to replay past loan (1=yes)	.32	.18
Not trustworthy (1=yes)	.25	.45
Low income (1=yes)	.16	.49

Further about same percentages of families in India and China told that they could not get needed amount of loan from these sources for various consumption and production purposes. These facts demonstrate that large number of families in these economies face substantial credit rationing from formal sources.

2. Table 6.2 summarizes the composition of loans of the families in these two countries. The loans obtained from banks and RCC belong to formal loan and the loans borrowed from friends and relatives belong to informal loan. Following facts are evident- (i) large percentage of the families depends on informal loans; (ii) informal loans constitute substantial part of total loan portfolios; and (iii) families belonging to lower quintiles of assets depend more on informal loans.

Table 6.2: Composition of Loan Portfolio of Families in India and China (percentages)

	India				China			
Quintile Assets	Formal Loan	Informal loan	N	Mean (Informal>0)	Formal Loan	Informal loan	N	N (Informal>0
1	32.82	35.5	72	.50	22.6	75.7	246	.84
2	36.91	48.38	48	.66	33.3	66.0	104	.79
3	46.29	44.66	67	.55	41.3	57.7	138	.73
4	61.95	28.37	70	.32	38.8	60.1	128	.77
5	63.22	26.2	57	.47	54.3	44.2	133	.66
Total	48.40	36.29	314	.52	35.9	62.8	749	.77

3. Loans are taken for both production purposes and emergent needs such as, consumption, health, funeral expenses etc. In both the countries about 25 percent of the borrowings seem to be done for such purposes, as shown in Table 6.3.

Table 6.3: Purpose of Borrowing by Families (percentages)

	India			China		
Quintile Assets	Loan risk	Loan production	N	Loan risk	Loan production	N
1	35	59	97	31	59	406
2	29	55	58	22	65	165
3	17	75	79	20	70	249
4	23	68	86	16	75	221
5	07	84	71	12	80	217
Total	23	68	391	22	68	1258

Evidently in both the countries larger percentages of families in lower quintiles of assets have borrowed to meet the urgent needs.

4. Limited access and availability of formal loans may compel the families to depend on informal borrowings. Also the data reveals that large percentages (50 percent) of families actually prefer informal loans to formal loans.

Informal financial transactions among close acquaintances (friends, and relatives) are usually characterized by (Udry, 1994; Fafchamps, 1999; Lund and Fafchamps, 2003): (i) no prescription of formal contracts; (ii) no explicit interest rates; (iii) state contingent repayment of loans, (iv) role reversal of agents as borrowers and lenders; and (vi) less importance of information asymmetry.

Investigation of financial transaction among relatives and friends is an evolving field of study. In the literature, risk sharing and consumption smoothing motives are given as important explanations for such financial transactions – a summary of which is briefly presented in section 2.

The chapter is organized as following. A brief literature review on informal lending and borrowing is presented in section 2. Then section 3 presents a formal analysis of informal lending among relatives and friends based on risk sharing and consumption smoothing motive. This analysis builds upon the works of Fafchamps (1999), Ligon, Thomas, and Worrall (2002), Thomas and Worrall (2002), Udry (1994) and

Koherlakota (1996). The analysis is enriched by explicit modeling of default in loan repayment and then attempting to solve the model explicitly. The primary contribution of this chapter is to characterize the loan amount, state contingent repayments, and default rates in equilibrium. This line of reasoning explains the risk sharing credit transactions as a sub game perfect equilibrium outcome of repeated interactions among the households. Also a simple test is suggested in the chapter to get inferences on risk sharing motives.

Household survey data from China and India have been used to conduct empirical investigation into the significance of some of the results obtained in section 3 and the inferences and evidences are discussed in section 4. Suitable econometric methods and appropriate identification strategies have been proposed to get evidences on the results related to risk sharing motives for informal lending and borrowing. Significant evidences are obtained related to risk sharing motives explaining the informal lending and borrowing. Section 5 concludes with important observations.

6.2. Literature Review

A brief review of important works related with informal financial transactions among relatives and friends is presented here.

Scott (1976) has explained such transactions as influenced by village level customs and mutual support in traditional societies. The transactions manifest in forms of gifts giving, reciprocal interest free credit, shared meals, and communal access to lands, sharing bullocks and work sharing arrangements.

Platteau and Abraham (1987) highlight such credit transactions as a mechanism of reducing risk in agrarian societies. They emphasize three different types of insurance through credit : (i) credit is a way to insure against the risk of falling into distress (ii) credit is given with a view to minimize the risk of income losses due to lack of labor,

and (iii) credit is given to make access to output as secure as possible. Their analysis was based on evidence from two village economies of small-scale marine fishermen in Kerala (India). They called such transactions as quasi credit – as debt repayment obligations are contingent on realized shocks that affect borrower and lender.

Coate and Ravallion (1993), using repeated game framework, have characterized the informal insurance arrangements that can be sustained as a non cooperative equilibrium for risk sharing purpose. Their analysis also suggested that divergences from optimal insurance arrangements will be greater in societies in which different incomes are less likely and time preference rates are high.

Udry (1994) has highlighted the role of credit as insurance in rural economy in contexts of rural credit markets in Northern Nigeria. He found the minimal use of collateral, very low interest rate charges, and need based access of loan. He argues that element of information asymmetry is not important here. In such information environment, credit transactions function as state contingent contracts that allow risk pooling between the debtor and creditor. He emphasizes that repayment obligations are usually renegotiated to accommodate shocks affecting lender and borrower.

Lund and Fafchamps (1997) in their study of rice farmers in Philippines observed that gifts and informal loans among friends and relatives are partly motivated by consumption smoothing motives but do not serve to efficiently share risk. They also find little evidence that transfers are motivated by altruism or by collateral constraints.

Fafchamps (1999) argue that informal credit between friends and relatives is a hybrid transaction of market exchange and gift giving, whose purpose is to overcome the enforcement problems of pure income pooling arrangements.

Thomas and Worrall (2002) have characterized the gift and loan transactions among friends and relatives as an outcome of dynamic game when reciprocation is voluntary action of agents. They describe this as quasi-credit transactions meant for informal

insurance arrangements. Further the nature of such quasi-credit transactions depend upon a host of parameters such as size of risk faced by families, coefficient of risk aversion coefficient, rate of time preferences etc.

Ligon, Thomas, and Worrall (2002) using general dynamic model come out with the findings that complete risk pooling is not attained because of limited commitment of agents. With limited commitment the mutual insurance arrangement can work only if promises of future reciprocity are sufficiently attractive and credible. Loan and gift transactions help in making such arrangements work.

6.3. Analysis of Informal Loan Transaction among Relatives and Friends

In Chapter 5, a simple example demonstrates the significance of informal loan transactions in solving the commitment problems in risk sharing. In these areas families interact over a long period of time – such interactions can be captured by infinitely repeated games framework wherein cooperation can be attained as sub game perfect equilibrium outcome. The history of cooperation is reciprocated with cooperation in next stage and any past deviation is punished in the next stage. The risk sharing arrangement thus becomes self-sustaining based on voluntary participation.

Now an analytics of loan transaction among family members and friends is presented here. This analysis builds upon works of Fafchamps (1999), Ligon, Thomas, and Worrall (2002), Thomas and Worrall (2002), Udry (1994) and Koherlakota (1996). Basically a two period loan transaction process is repeated ad infinitum and then the sub game perfect equilibrium concepts is used. Further the analysis is enriched using explicit modeling of default in loan repayment and then attempt has been made to solve the model to get explicit results.

6.3.1 Description of the Model

I assume that there are two households. Each one faces stochastic income $\{y^1{}_t\}_{t=0}^{t=T}$, and $\{y_t^2\}_{t=0}^{t=T}$ over a horizon of time period T. Now a simple illustration of lending and state contingent repayment is considered. For a simple and tractable analysis I consider a two period analysis. In each period, household 1 gets income either $z^1+\sigma^1$ with probability p or $z^1-\sigma^1$ with probability 1-p. Similarly household 2 gets income $z^2+\sigma^2$ with probability q and $z^2-\sigma^2$ with probability 1-q. Suppose further that in the year 0, the household 1 gets income $z^1-\sigma^1$ and household 2 gets income $z^2+\sigma^2$. They enter into loan transaction agreement such that, the household 2 lends \$B and also they agree for state contingent repayment R_s^1 in next period as shown in Table 6.4. Here R is the minimum repayment amount that is paid in the case of bad outcome in the next period – which can be thought of as a function of risk premium which the household is willing to pay to avoid the risk (equation 5.8). And C_1 is additional repayment in good state of income. So for a risk premium of $\pi(y) = (1/2)\sigma^2\ \gamma(y)/y_m$ and a choice parameter k ,let us assume that

$$R = k\pi(y) = k(1/2)\sigma^2\gamma(y)/y_m; \quad \text{and } R < B; \quad \text{and } R < y_s^1 \quad \text{for all s} \qquad ...(6.1)$$

The income, repayment and lending process in next period is shown in Table 6.4.

Table 6.4: Income, Lending and Borrowing and Repayment in the Next Period

Probability for different states s	Income of household 1 y_s^1	Income of household 2 y_s^2	Repayment/ Transfer from household 1 R_S^1
pq = π_1	$z^1+\sigma^1$	$z^2+\sigma^2$	R+$C_1 \geq$ B
p(1-q)= π_2	$z^1+\sigma^1$	$z^2-\sigma^2$	R+$C_1 \geq$ B
(1-p)(1-q)= π_3	$z^1-\sigma^1$	$z^2-\sigma^2$	R
(1-p)q= $\pi_{4\ 1}$	$z^1-\sigma^1$	$z^2+\sigma^2$	R

This repayment scheme assumes that there is no default. But it can not be ruled out – as empirically some default has also been observed. Now it is assumed that there is probability of default θ, which is uniformly distributed - $\theta \in [\underline{\theta}, \bar{\theta}]$. In the present set up we simply assume 0≤ θ ≤ 1. Hence in the period 1 the resource available to household 1 is, $c_s^1 = (y_s^1 - (1-\theta_s)R_S)$ and the resources available to household 2 is, $c_s^2 = (y_s^2 + (1-\theta_s)R_S)$. Also it is assumed that the household 1 faces social sanction for default that costs him utility loss of $D^1(\theta_s, R_S)$, where $D^1(\theta_s, R_S)$ is increasing in both arguments, convex in θ_S and R_S, and $D^i{}_1(\theta_s, R_S) > 0$, $D_2{}^i(\theta_s, R_S) > 0$, i.e. more punishment is needed to check bigger temptation of default in the higher repayment state to sustain the loan transaction process. It is also assumed that these two periods lending, borrowing and repayment arrangement is repeated over time. Using separable well behaved von Neumann-Morgenstern utility function, the household 1's net discounted utility (in infinite horizon) maximization program is as following:

$$\max_{\{B,k,C_1,\theta_s\},c_s^i>0} U^1(c_s^1,\theta) = \frac{1}{1-\beta^2}[u^1(z^1-\sigma^1+B) + \beta[\sum_{S=1}^{S=4}\pi_S(u^1(y_s^1-(1-\theta)R_S)) - D^1(\theta,R_S))]] \quad \ldots(6.2)$$

$U^2(c_s^2,\theta_s)$ is defined similarly.

6.3.2 Pareto Efficient Arrangements

First I characterize the unconstrained Pareto efficient arrangement, by maximizing the sum of weighted utility of the agents subject to overall resource constraints;

$$\max_{(B,k,C_1,\theta_s)} U^1(c_s^1,\theta_s) + \lambda U^2(c_s^2,\theta_s) \quad \ldots(6.3)$$

s.t. $c_s^1 + c_s^2 \le y_s^1 + y_s^2 = \bar{y}$; and $c_s^i > 0$ for all s (states) and time periods

Here λ is the relative weight of utility of agent 2. For optimal values of decision variables, differentiating the sum of utilities with respects to c_s^1 and c_s^2 respectively and then taking the ratio we get

$$U^1{}_1(\ c_s^1,\theta_s)/\ U^2{}_1(\ c_s^2,\theta_s)\ = 1/\lambda \quad : \qquad \text{for all s (states) and time periods} \qquad \ldots (6.4)$$

This finding is summarized in the Result 6.1.

Result 6.1: The allocation is Pareto efficient, if in all states the ratio of marginal utility of consumption is a constant. Further it can be shown that the optimal level of default θ_s is zero, otherwise the constancy requirement of equation (6.4) will be violated. So any default observed in decentralized equilibrium is inefficient.

If the social planner induces renegotiation between the parties that reduces default, then utility of both parties can be improved and hence zero value of θ is optimal. Once the default level is zero then equation (6.4) reduces to perfect risk sharing equation.

This is the benchmark case from which all deviations (achieved in decentralized equilibrium) is to be measured in terms of aggregate efficiency loss. In the first best case the agents smooth their consumption across time and states.

6.3.3 Equilibrium Outcome

Having studied the nature of first best results, the equilibrium allocations are characterized. The agents participate in the mutual lending and repayment process as a part of agreement to cooperate and play high payoff equilibrium if each one cooperates, otherwise low payoff equilibrium is played and agents go back to the autarchy position. For such repeated interactions, the concept of subgame perfect Nash equilibrium (Selten 1965)[38] is appropriate–in which the credible threats and

[38] Followed from Gibbons, Robert (1992).

promises about future behavior can influence present behavior. The key elements of subgame perfect equilibrium are:

1. A strategy profile for both agents, such that after observing a history of outcomes the actions of an agent are optimal given the strategy profile of other player.
2. Prescribing the credible punishment element, which each agent faces in the case of deviation from prescribed strategy in the previous outcome.
3. The players' strategies constitute Nash equilibrium in every subgame.

In the present set up the two period interaction is a subgame (also stage game) which is repeated over time and the outcomes in each such repetitive two stage interaction will be similar except that agent 1 and agent 2 may change their role (of borrower or lender) depending on the outcome of endowments and also on the history of actions.

Essentially the subgame perfect equilibrium prescribes for self-enforceable incentive compatible contracts. Hence following program need to be solved:

$$\max_{\{B,k,C_1,\theta_s\},c_s^i>0} U^1(c_s^1,\theta) = \frac{1}{1-\beta^2}[u^1(z^1-\sigma^1+B) + \beta[\sum_{S=1}^{S=4}\pi_S(u^1(y_s^1-(1-\theta)R_S)) - D^1(\theta,R_S))]] \quad ...(6.5)$$

such that

$$U^2(c_s^2,\theta_s) = \frac{1}{1-\beta^2}[u^2(z^2+\sigma^2-B) + \beta[\sum_{s=1}^{s=4}\pi_s(u^2(y_s^2+(1-\theta_s)R_s))] \geq \bar{V^2} \quad : \mu$$

This is participation constraint for agent 2.

$$U^1(c_s^1,\theta_s) - \bar{V^1} \geq u^1(z^1-\sigma^1) - u^1(z^1-\sigma^1+B) : \text{self enforcement condition} : \nu 1$$

$$U^2(c_s^2,\theta_s) - \bar{V^2} \geq u^2(z^2+\sigma^2) - u^2(z^2+\sigma^2-B) : \text{ self enforcement condition} : \nu 2$$

The left hand side shows net gain from continued particupation , and the right hand side shows net gain from not participating in the risk sharing game.

These constraints must satisfy for all t, and s.

Where $\bar{V}^i$, is agent i's discounted sum of utility in autarchy $= E\sum_{t=0}^{t=\infty} \beta^t u(y_t^i)$

Among these constraints the first two constraints do not bind, if the first one binds then the third constraint will be violated and also if the second constraint binds then the first agent actually gets less than what she could get in autarchy. Intuitively the last constraint binds otherwise the agent 1 can borrow more without violating other constraints. This implies that $\mu = 0$, $\nu 1 = 0$, and $\nu 2 > 0$. The last constraint with equality sign can be used to preliminarily find the value of B with reasonable assumptions on parameters and values. If this constraint is transformed as difference of left hand side and right hand side of the equation, then it is a monotonically decreasing function of B. This is shown in Figure 6.1. For example, if agent 1 and agent 2 get income 500 and 1000 alternatively in each period (agent 1 starts with the lower one), and all states are equally probable, β=0.90, default rate $\theta = 0.1$, and repayment amount R = 200, then equilibrium value of B= 200 is obtained. Note that the first best value (perfect risk sharing) of B is 250.

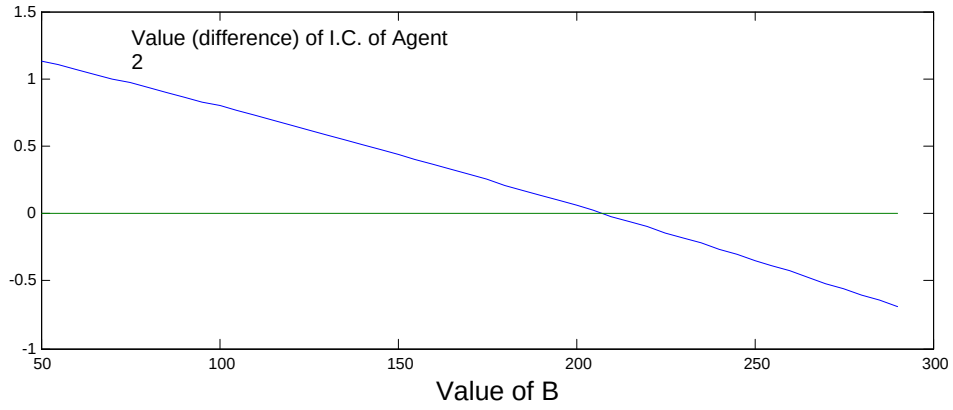

Figure 6.1: Amount of Borrowing as determined by Incentive Constraint of Agent 2

Now program (6.5) will be solved to find the expressions of the choice variables in equilibrium. For tractability, the program will be solved in stages and the expressions of choice variables will be characterized to get insights into the mechanics of informal lending, borrowing and repayments.

6.3.3.1. Characterization of Default Level in Equilibrium

Household 1 will choose θ_s, which maximizes his expected utility in period 1.

$$\theta_s = \arg\max_{\theta s} \ \beta[\sum_{S=1}^{S=4} \pi_S (u^1(y_s^1 - (1-\theta)R_S)) - D^1(\theta_s, R_S))] \qquad \ldots (6.6)$$

This gives first order necessary and sufficient conditions as,

$$[(u^{1`}(.)R_S - D_1^1(\theta_s, R_S))] = 0 \qquad \Rightarrow u^{1`}(.)R_S = D_1^1(\theta_s, R_S)) \text{ for all s} \qquad ...(6.7)$$

The equation (6.7) pins down the level of default in equilibrium in each state.

This simply tells that in equilibrium the quantum of default θ is such that marginal benefit from defaulting equals to its marginal cost. For a fixed value of R we can plot $u^{1`}(.)R_s$ and $D_1^1(\theta_s, R_s))$ against θ on X axis. Note that $u^1(.)$ is strictly concave, hence $u^{1`}(\ y_s^1 - (1-\theta_s)R_s.)\,R_s$ is decreasing in θ but increasing in R, and $D_1^1(\theta_s, R_s))$ is increasing in θ and R because of our assumptions $D^i{}_1(\theta_s, R_S) > 0$, $D_2{}^i(\theta_s, R_S) > 0$

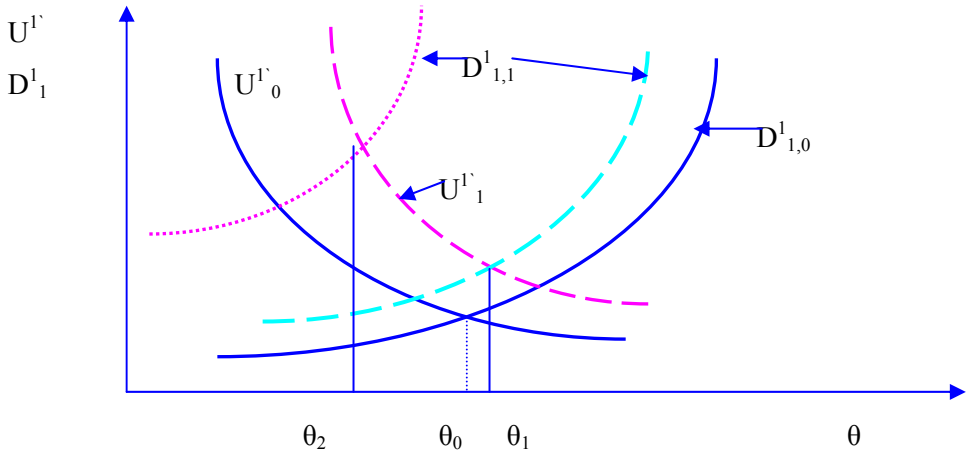

Figure 6.2: Equilibrium level of Default and Repayment

In figure 6.2 for a given value of R the intersection of $U^{1`}{}_0$ and $D^1{}_{1,0}$ represents equilibrium level of default. With increasing level of transfer or repayment obligations, R the equilibrium level of default may increase or decrease depending on the relative shifts of the two curves -as shown in the figure 6.2. If with increasing R, $D^1{}_{1,1}$ shifts a lot compared to that of shift of $U^{1`}{}_1$, then the default level θ_2 actually decreases. But with shifts of the curves within reasonable limits, θ actually increases to θ_1 with higher transfer or repayment obligations. A simple example demonstrates this. Let u(c) =ln(c); and $D^1(\theta, R) = \exp(\theta)\ \theta\ Ra$; where a is a constant. Then default constraint implies that

$$\Rightarrow R/(y-(1-\theta)R) = \exp(\theta)(1+\theta)\ Ra \quad \Rightarrow \exp(\theta)(1+\theta)a(y-(1-\theta)R) = 1 \quad \ldots(6.8)$$

For given values of y, R and other parameters, equation (L8) solves for θ

Now ; fully differntiating the above w.r.t. R we get $\Rightarrow \dfrac{d\theta}{dR} = \dfrac{1-\theta^2}{y(2+\theta)+R(\theta^2+2\theta-1)} \geq 0$

Also fully differentiating (6.8) w.r.t. y we get $\Rightarrow \dfrac{d\theta}{dy} = -\dfrac{1+\theta}{y(2+\theta)+R(2\theta+\theta^2-1)} < 0$

For example Table 6.5 summarizes the default level for different combinations of y and R representing for bad and good state of agent 1 (here a = 1/1000).

Table 6.5: Default rates in Bad and Good State

	y=500; R=200: bad state	y=1000; R=280: good state
Default level = θ	.50	.14

This shows that with increasing income the default percentage decreases in equilibrium and also for fixed value of y it increases with repayment obligations. However if the default punishment function is strictly convex in R such that the

marginal cost of default increases sharply with increasing repayment obligations then the equilibrium level of default will actually decrease. For example if $D^1(\theta, R) = \exp(\theta)\theta R^2 a$, then

$$\frac{d\theta}{dR} = -\frac{(y - 2R(1-\theta))(1+\theta)}{(2+\theta)(y-(1-\theta)R)R + R^2(1+\theta)} \leq 0 \text{ , for reasonable values of R and y}$$

These observations are summarized in the following result.

Result 6.2: The equilibrium level of default tends to increase with repayment or transfer obligations and decreases with increasing income level. The same can decrease if the default punishment function is made increasing and strictly convex in R such that the marginal cost of default increases more than the marginal gain with increased R.

6.3.3.2. Characterization of Amount of Borrowing in Equilibrium

Now expression for the equilibrium level of B satisfying the subgame perfect program (6.5) and the constraint $R + C_1 \geq B$ is obtained. Let μ, ν1 and ν2 be the Lagrange multipliers associated with the first three constraints (Reservation utility level of agent 2, self enforcing conditions for agent 1 and agent 2 respectively) in (6.5) and ψ be the Lagrange multiplier associated with the constraint $R + C_1 \geq B$. All the multipliers are non negative. Using first order condition for B we get:

$$(1+\nu 1+(1-\beta^2)\nu 1)u^{1`}(y^1 - z^1 + B) - (\mu + \nu 2 + (1-\beta^2)\nu 2)u^{2`}(y^2 + z^2 - B) - \psi = 0$$

$$(1+\nu 1+(1-\beta^2)\nu 1)u^{1`}(y^1 - z^1 + B) = (\mu + \nu 2 + (1-\beta^2)\nu 2)u^{2`}(y^2 + z^2 - B) + \psi \quad ..(6.9)$$

The left hand side represents marginal benefit from borrowing and right hand side represents marginal cost of borrowing in terms of equation parameters and constraint

coefficients. Further we can characterize the variation of B w.r.t. ψ ;
fully differentiating w.r.t. ψ on both sides of equation (6.9) we get, equation (6.10) :

$$\frac{dB}{d\psi}[((1+\nu 1+(1-\beta^2)\nu 1)u^{1'''}(y^1-z^1+B)+(\mu+\nu 2+(1-\beta^2)\nu 2)u^{2``}(y^2+z^2-B)]=1$$

Since $u``<0$, hence $\frac{dB}{d\psi}<0$, so maximum possible borrowing occurs when $\psi=0$; i.e. repayment/transfer condition holds with strict inequality, i.e. $R+C_1>B$

The above result is quite intuitive. When $R+C_1$ (repayment in good state) strictly exceeds B (loan amount) then more borrowing is possible compared to the case when $R+C_1$ just equals B. Now for simple illustration, let us assume that u(c) = ln(c) for both agents and examining for interior solutions only – we get following first order condition

$$\frac{1}{z^1-\sigma^1+B}-\frac{\mu}{z^2+\sigma^2-B}+\frac{\nu 1(2-\beta^2)}{z^1-\sigma^1+B}-\frac{\nu 2(2-\beta^2)}{z^2+\sigma^2-B}-\psi=0$$

Let $z^1-\sigma^1=y1$ and $z^2+\sigma^2=y2$

$$\Rightarrow (y2-B)(1+\nu 1(2-\beta^2))=(y1+B)(\mu+\nu 2(2-\beta^2))+\psi(y1+B)(y2-B)$$

With further simplification we assume that $R+C_1$ *strictly* exceeds B (by a small markup implying a lower interest rate than market rate) so that the Lagrange multiplier $\psi=0$.

$$\Rightarrow B(\mu+\nu 2(2-\beta^2)+1+\nu 1(2-\beta^2))=y2(1+\nu 1(2-\beta^2))-(\mu+\nu 2(2-\beta^2))y1$$

$$\Rightarrow B=\frac{y2(1+\nu 1(2-\beta^2))-(\mu+\nu 2(2-\beta^2))y1}{(\mu+\nu 2(2-\beta^2)+1+\nu 1(2-\beta^2))} \qquad \ldots(6.11)$$

For example, if y1 = 500, and y2 =1000, $\nu 1=0$ (agent 1's incentive constraint not binding), and $\mu=0$, and $\nu 2(2-\beta^2)=1.15$, then B = 200, which is quite realistic.

Also from equation (6.11) we get, $\partial B/\partial y2\geq 0$ and $\partial B/\partial y1\leq 0$.

Hence the loan amount decreases with borrowers income and increases with lender's income, which is realistic. Also this result indicates that when $\psi = 0$ (i.e. $R+C_1 > B$), then μ and $\nu 2$ simultaneously can not be zero, otherwise B = y2, which violates the positive consumption constraint for each one. This finding corroborates to the earlier observation that $\nu 2 > 0$. The lending partner agrees to lend to the point where her self enforcing constraint binds. These findings are summarized in the Result 6.3.

Result 6.3: Equilibrium loan amount B is a monotonically decreasing function of the borrower's income and monotonically increasing function of the lender's income. The maximum possible borrowing takes place when the repayment in good state of borrower strictly exceeds the borrowed amount. Also lender's self enforcing constraint binds in equilibrium. Hence the first best result is not attained in equilibrium.

Another interesting observation is that $\delta B/\delta \nu 1 > 0$. Hence maximum level of borrowing that sustains in equilibrium is when the self enforcing constraint of agent 1 does not bind ($\nu 1 = 0$) – and the moment this constraint binds ($\nu 1 > 0$) borrowing tends to increase abruptly, which will violate other constraints. If both of the self enforcing constraints are not binding ($\nu 1$ and $\nu 2$ equal to zero) then it approaches the first best result which is attained if default level θ is zero. However the incentive constraint of agent 2 binds ($\nu 2 > 0$), otherwise agent 1 may further increase his borrowing without compromising the constraints; hence the first best result is not attained in equilibrium.

6.3.3.3. Characterization of Additional Repayment Amount C_1 in Equilibrium

Now I will attempt to characterize C_1, the additional repayment (more than R) optimal in good state of agent 1. Using the first order conditions with respect to C_1:

$$(1+\nu 1)\beta E[u^{1'}(y_s^{\ 1} - (1-\theta_s)R_s).\frac{-(1-\theta_s)dR_s}{dC_1} - \frac{dD(\theta_s, R_s)}{dR_s}.\frac{dR_s}{dC_1}] +$$

$$(\mu+\nu 2)\beta E[u^{2'}(y_s^{\ 2} + (1-\theta_s)R_s).\frac{(1-\theta_s)dR_s}{dC_1}] + \psi = 0$$

Where $R_S = (R + C_1)$ in good state with probability of states $= \{\pi_1, \pi_2\}$

$$\Rightarrow \beta E(\frac{dR_s}{dC_1}[-(1+\nu 1)(1-\theta_s)u^{1`}(y_s^{\ 1} - (1-\theta_s)R_s) - \frac{dD(\theta_s, R_s)}{dR_s}] +$$

$$(\mu + \nu 2)(1-\theta_s)u^{2`}(y_s^{\ 2} + (1-\theta_s)R_s)]) + \psi = 0 \qquad ...(6.12)$$

$$\Rightarrow \beta E(\frac{dR_s}{dC_1}[(1+\nu 1)(1-\theta_s)u^{1`}(y_s^{\ 1} - (1-\theta_s)R_s) + \frac{dD(\theta_s, R_s)}{dR_s}] =$$

$$(\mu + \nu 2)(1-\theta_s)\beta E[\frac{dR_s}{dC_1}u^{2`}(y_s^{\ 2} + (1-\theta_s)R_s)] - \psi$$

Now if we fully differentiate the above equation w.r.t. ψ, we get

$\frac{\partial C_1}{\partial \psi} < 0$; So maximum repayment in good state (for borrower) occurs when $\psi = 0$. i.e. total repayment in good state strictly exceeds the borrowing.

Moreover fully differentiating the equation (6.12) w.r.t. y_1^1 *and* y_2^2 separately, we get

$\frac{\partial C_1}{\partial y_1^1} > 0$ and $\frac{\partial C_1}{\partial y_2^1} > 0$ and so also we get $\frac{\partial C_1}{\partial y_1^2} < 0$ and $\frac{\partial C_1}{\partial y_2^2} < 0$.

Again the result is quite intuitive – subject to the repayment constraint, the optimal value of C_1 in equilibrium is such that the marginal cost of repayment in good state equals the marginal benefit gained from this. Now using the value of $\psi = 0$, we get:

$$(1+\nu 1)\beta E(\frac{dR_s}{dC_1}[(1-\theta_s)u^{1`}(y_s^{\ 1} - (1-\theta_s)R_s) + \frac{dD(\theta_s, R_s)}{dR_s}] = \qquad ...(6.13)$$

$$(\mu + \nu 2)\beta E[\frac{dR_s}{dC_1}(1-\theta_s)u^{2`}(y_s^{\ 2} + (1-\theta_s)R_s)]$$

Solving the above equation – we can get an expression of C_1 such that

$$C_1^* = C_1(y_1^1, y_2^1, y_1^2, y_2^2, \pi_1, \pi_2, \theta_1, \theta_2, R, \mu, \nu 1, \nu 2, \beta) \qquad ...(6.14)$$

Again for simple elucidation – let us use u(c) = ln(c) for both agents and D (.) = (exp (θ) θR a)$_s$; then using the equation (6.13) we get

$$\beta(1+\nu 1)[\frac{\pi_1(1-\theta_1)}{(y_1^1-(1-\theta_1)(R+C_1)}+\frac{\pi_2(1-\theta_2)}{(y_2^1-(1-\theta_2)(R+C_1)}+\pi_1\exp(\theta_1)\theta_1 a+\pi_2\exp(\theta_2)\theta_2 a]$$

$$=\beta(\mu+\nu 2)[\frac{\pi_1(1-\theta_1)}{(y_1^2+(1-\theta_1)(R+C_1)}+\frac{\pi_2(1-\theta_2)}{(y_2^2+(1-\theta_2)(R+C_1)}] \qquad \ldots(6.15)$$

The left hand side of the equation (6.15) is monotonically increasing in C_1 and the right hand side is monotonically decreasing in C_1 ,hence real value of C_1 is guaranteed. Also for a reasonable values of endowments and parameters as shown below, value of $C_1 = 45$ is obtained, which is realistic. It is to be noted that with these values, loan amount in equilibrium, B*= 200 was found earlier. This is also shown in Figure 6.3. Important characterization of C_1* is mentioned in the Result 6.4.

$\nu 1 = 0,\ \beta = .90,\ \pi_1 = .25,\ \theta_1 = .10,\ \pi_2 = .25,\ \theta_2 = .10,\ \beta(\mu+\nu 2) = 1.05$ and

$y_1^1 = 1000,\ y_2^1 = 1000,\ y_1^2 = 1000,\ y_2^2 = 500,\ R = 180;\ a = 1/1000$

Result 6.4 : The optimal value of C_1 in equilibrium, as expressed in equation (6.14), is a function of income endowments, states probabilities, and default probabilities across states, constraint coefficients, and the minimum payment in all states. Also C1* monotonically increases with the income of borrower and monotonically decreases with the income of lender in all states. Maximum value of C_1* is achieved when the repayment in good state of borrower strictly exceeds the borrowed amount B.

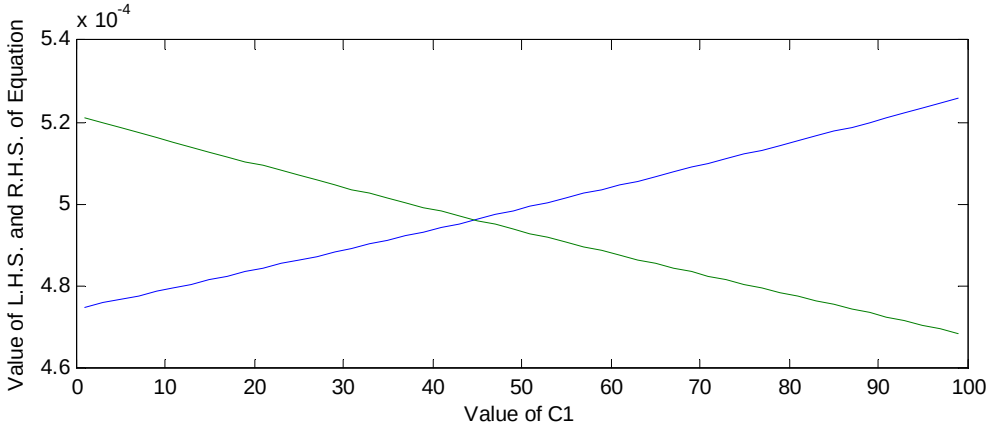

Figure 6.3: Value of Additional Payment in Good Period

6.3.3.4. Characterization of Minimum Repayment Amount R, in Equilibrium

So far the expressions and comparative statics of θ_s (default probability across states), B (amount of borrowing) and C_1 (additional repayment in good state of borrower) have been characterized. Also it has been assumed that the minimum repayment across all states R is a function of risk premium of the borrower as expressed by equation (6.1) : $R = k\,\pi(y) = k\,(1/2)\sigma^2\,\gamma(y)/y_m$, where k is a choice parameter. Then using the program (6.5) optimal value of k can be pinned down, but it gives a complicated expression. Alternatively a value of k can be chosen mutually by the households 1 and 2; which may depend on local conditions, customs and household characteristics (land/asset endowments, earlier default history, indebtedness etc.). Then using k as a parameter, optimal values of θ_s, B and C_1 can be obtained using earlier expressions.

The equations 6.6, 6.9, and 6.12 describe the first order conditions for equilibrium values for θ_s, B and C_1 . Further the program 6.5 prescribes three self enforcing constraints. Using these equations, constraints, and value of k, the equilibrium values of choice variables R, θ_s, B and C_1 can be obtained – but solving this way becomes intractable. Hence sequential way of solving has been demonstrated here for illustration. The tractable way of logically analyzing this program is summarized as following: (i) Value of R is fixed as suggested above. (ii) Using this value of R value of θ is obtained using equation (6.6). (iii) Using equations (6.9) and (6.12) and constraints in program 6.5, and also logical assumptions on constraint coefficients μ, $\nu 1$, and $\nu 2$, values of B and C_1 and constraint coefficients can be obtained.

6.4. Empirical Analysis: Risk Sharing Motive for Informal Loan Transactions

Analytical framework developed in the foregoing section helps us in understanding the mechanism of risk sharing credit transactions among close acquaintances, which is

quite prevalent in the rural areas of developing countries. These financial transactions are done both for undertaking production activities and also to meet urgent needs.

It has been emphasized that the income of the families living in rural areas of the developing countries are quite volatile showing high values of coefficient of variation. The families in these areas face various types of risks (yield risk, price risk, and weather risk) and uncertainties (illness, cattle loss etc.), as evident from Table 6.6.

Table 6.6: Percentage of Families Facing Various Risk and Uncertainties

Variable (1=yes, 0=no)	Mean Value: China	Mean Value : India
Price Risk	.07	.06
Yield Risk	.06	.10
Weather Risk	.05	.09
Suffered Crop Loss, Cattle Loss	.70	.90
Suffered Death or Major Sickness in Family	.68	.91

To mitigate these risks, these families adopt various ex ante and ex post risk management options – some of these are summarized in table 6.7.

Table 6.7: Risk Management Options for Families in Rural Areas

Risk Management Options (scale : 1-5; in the order of increasing importance)	Mean. : India (N=400)	Mean. : China (N=1200)
Crops/ animal/ enterprise Diversification	3.94	3.95
Geographic diversification of plots	3.53	3.42
Irrigation	4.24	4.25
Spreading of sale of crops	3.03	3.45
Forward contracts of crops	2.84	3.45
Government Programs	3.23	3.89
Financial Reserves	3.67	3.70
Off farm income	3.59	3.99

One ex post mechanism is to borrow to meet the expenses requirements. In both the countries almost 25 percent of the borrowings seem to be done for such purposes.

To smooth their consumption and satisfy other needs they usually take recourse to - (a) borrow from formal credit market, (b) do precautionary savings, (c) enter into

mutual risk sharing arrangements, and (d) depend on informal borrowing from friends and relatives.

A large number of families have been found to be credit rationed in these areas; these issues have been analyzed in Chapter 3. Here empirical strategies are developed to infer the significance of risk sharing motivations for informal lending and borrowing among friends and relatives.

Result 5.5 asserts that introducing a loan element in the process of risk sharing, enables the process to sustain with more impatient agents. Also Result 6.1 states that in the first best case the optimal level of default θ_s is zero. So any default observed in decentralized equilibrium is inefficient. If the social planner induces renegotiation between the parties that reduces default, then utility of both parties can be improved and hence zero value of θ is optimal. Money gifts and informal loan transactions among friends and relatives are important ways of risk sharing.

It has been highlighted that; i) large percentage of people depends on informal loans for their credit needs, almost 50 percent in India and 70 percent in China; (ii) informal loans constitute substantial part of total loan portfolios, almost 40 percent in India and 60 percent in China, particularly for families belonging to lower quintiles of assets.

Further the data reveals that in both the countries more than 70 percent families and 90 percent families have engaged in gift transactions and loan transactions respectively in emergencies. This demonstrates that people do share risk on a large scale and moreover preference for loan transaction dominates. These findings give credence to Result 5.5. Also more than 80 percent families do not prefer to default on such loans and further almost same percentage of families agree that community pressure helps in reducing defaults on such loans. These finding give credence to Result 6.1.

Table 6.8 reports various key aspects of gifts and credit transactions among the friends and relatives. Evidently preferences for loan transactions are much higher than for

gifts transactions in both countries. In emergency situations gifts transactions take place on a large scale, although the loan transactions dominate. Also major fractions of families prefer loan transactions in both normal and emergency conditions. Large fractions of families also agree that community pressure helps in reducing defaults.

Table 6.8: Important Aspects of Informal Financial Transactions among Friends or Relatives

Variable (mean value shows the fraction of respondents who agree to the question: 1=yes)	Mean Value : India (N=400)	Mean Value: China (N=739)
Gift transactions among friends and relatives	.67	.25
Gift transactions(stronger version: both gave and received)	.36	.05
Loan transactions among friends and relatives	.97	.94
Loan transactions(stronger version: both lent and borrowed)	.60	.70
Gift for emergency purposes	.71	.59
Loan for emergency purposes	.96	.98
Prefer loan for emergency purposes	.88	.82
Prefer loan for general purposes	.73	.84
Prefer not to default on such loans	.80	.93
Community pressure helps in reducing default	.76	.63

Further important motivations for such financial transactions are reported in Table 6.9. Evidently large percentage of families prefer to borrow (lend) from friends and relatives. Substantial percentages of families find this convenient and also loan and interest repayment terms are found to be flexible. Considerable percentages of families do such financial transactions as they trust that loans will be repaid. But also a good percentage of families agree to give loans even they do not trust that loan will be repaid and also a good percentage of families agree to borrow or lend even they have been refused earlier by their friend and relatives.

These findings clearly highlight the importance of informal financial transactions (gifts and loans) for the risk sharing purpose.

Table 6.9: Important Motivations of Financial Transactions among Friends or Relatives

Variable (mean value shows the fraction of respondents who agree to the question: 1=yes)	Mean Value : India (N=400)	Mean Value: China (N=739)
Prefer to borrow from friends or relatives	.50	.72
Flexibility in loan repayment	.87	.93
Flexibility in interest amount repayment	.83	.76
Borrowing from friends or relatives convenient	.89	.96
Trust that loans given to friends or relatives will be repaid	.79	.90
Loans given even not trust that loan will be repaid	.45	.63
Agree to borrow or lend even they have refused earlier	.27	.52

Further, Table 6.10 reports the percentage of families defaulting and delaying on repayment of formal and informal loans. Clearly default percentage on both types of loan is almost same, but delay in repayment of informal loans is significantly higher than that of formal loans. This in a way shows the flexibility of repayments of informal loans.

Table 6.10: Default and Delay in Repayment of Formal and Informal Loans

Variable	Mean Value (N=384) India	Mean Value (N=1514) China
Default on formal Loan	.23	.03
Default on Informal Loan	.20	.04
Delay on Formal Loan	.51	.15
Delay on Informal Loan	.61	.38

6.4.1 Econometric Model of Choice of Formal and Informal Credits

Before proposing the estimation model of risk sharing motives of informal credits, it is important to understand choice process of formal and informal loans. It has been observed in the data that some families have taken only informal loans, some have taken only formal loans and some families have taken both types of loans and some families have taken neither type of loans. Important household characteristics seem to be significantly different for families taking either formal or informal loan as shown in

Table 6.11. Evidently families taking formal loan on average are having more assets and income, more education, bigger family size, bigger loan size, and more savings. Also these families are using larger percentage of loan for production purposes.

Table 6.11: Important Household Characteristics of Families Taking Formal and Informal Loans

Variable **(India)**	Mean (Only Informal)	Mean (Only Formal)	Mean (Both)	Mean (None)
N	104	127	66	28
Farm Size (acre)	2.35	3.59	3.47	1.70
Household income	36033.6	54755.9	43659.1	44085.7
Percent Farm income	52.65	62.07	62.98	45.54
Household size	6.03	7.37	6.05	5.82
education (1-4)	2.43	2.77	2.71	2.18
Sickness (1=yes)	0.35	0.46	0.52	0.07
Amount of debt	7338.9	19300.8	29287.8	4071.4
Asset Value	321644.2	462126.0	421818.2	283928.6
Saving(0-3)	0.85	1.05	1.14	0.79
Trusts that loan will be repaid	0.78	0.80	0.82	0.64
Denied loan for collateral	0.26	0.18	0.38	0.07
Loan for risk management	0.40	0.12	0.17	0.11
Loan for production	0.48	0.84	0.73	0.86

Table 6.11 (continued)

Variable **(China)**	Mean (Only Informal)	Mean (Only Formal)	Mean (Both)	Mean (None)
N	429	174	198	8
Farm Size (acre)	4.67	6.61	5.90	5.35
Household income	9065.47	14341.49	12208.15	8287.50
Percent Farm income	48.05	45.44	39.90	31.06
Household size	4.43	4.71	4.52	4.38
education (1-4)	2.29	2.42	2.42	2.50
Sickness (1=yes)	0.22	0.19	0.26	0.63
Amount of debt	10310.1	17888.4	28657.4	21437.5
Asset Value	39639.2	63886.2	65441.2	51000
Saving(0-3)	0.82	0.81	0.51	1.50
Trusts that loan will be repaid	0.90	0.88	0.87	1.00
Denied loan for collateral	0.26	0.21	0.21	0.75
Loan for risk management	0.28	0.10	0.21	0.20
Loan for production	0.64	0.87	0.65	0.80

Now each of these decisions can be estimated using the following equations.

$$B_F = 1((\mathrm{B}_\mathrm{F}^* = \mathrm{X}_\mathrm{F}\beta_F + \varepsilon_\mathrm{F}) > 0) \quad : \varepsilon_\mathrm{F} \approx N(0, \sigma_F^2) \qquad ...(6.16)$$

Here B_F^* is the latent propensity of having formal loan. The observed variable is B_F - which is observed as 1 if the latent variable is positive , i.e. the family borrows from formal sector and Zero otherwise. X_F is a vector of exogenous covariates, β_F is a vector of parameters, ε_F is the random error term that is assumed to be normally distributed with zero mean and variance σ^2_F .

It is assumed that $\sigma_F^2 = 1$, since β_F is identified upto a scalable factor only.

Similarly $B_I = 1((\mathrm{B}_\mathrm{I}^* = \mathrm{X}_\mathrm{I}\beta_I + \varepsilon_\mathrm{I}) > 0) \quad : \varepsilon_\mathrm{I} \approx N(0, \sigma_I^2) \qquad ...(6.17)$

Here B_I^* is the latent propensity of having informal loan and other descriptions are similar.

6.4.1.1 Identification Strategy

These two decisions by a household are realistically interrelated implying that the correlations of these equations' disturbances may be significant. Hence the estimation of the parameters may be consistent but not efficient if the two equations are estimated independently. Hence the parameters are estimated using the multivariate probit model, assuming the regressors are exogenous. Important explanatory variables are family asset, income, education, family size, age, preference for informal loan etc. The model is described as following.

$B_F^* = \mathrm{X}_\mathrm{F}\beta_F + \varepsilon_\mathrm{F}$ and $\mathrm{B}_\mathrm{I}^* = \mathrm{X}_\mathrm{I}\beta_I + \varepsilon_\mathrm{I}$

and $$\begin{pmatrix} \varepsilon_\mathrm{F} \\ \varepsilon_\mathrm{I} \end{pmatrix} \approx N\left\{ \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix} \right\} \qquad ...(6.18)$$

6.4.1.2 Estimation of the Model

The summary statistics of important socio-economic, credit rationing, credit transactions, and social preference variables for India and China are presented in Tables 6.12, 6.13, 6.14, 6.15, 6.16, 6.17, 6.18, and 6.19.

Table 6.12: Summary Statistics of Important Socio-Economic Variables (India)

Variable (India)	Obs	Mean	Std. Dev.	Min	Max
sex (Female=1)	399	0.00	0.05	0.00	1.00
age	399	47.45	11.54	22.00	92.00
Education(1-7)	399	3.54	1.60	1.00	7.00
Education (1-4)	399	2.52	0.82	1.00	4.00
Household size	399	6.58	3.30	1.00	30.00
Years of Farming	399	24.05	11.82	2.50	70.00
Farm Size (acre)	399	2.96	2.39	0.15	20.00
Income source(farm=1)	399	0.78	0.42	0.00	1.00
Household Income (Rs.)	399	45440.85	37579.16	2400.00	300000.0
Percent Farm income	399	57.40	25.86	3.00	100.00
Household Asset Value (Rs.)	399	384313.30	359938.90	16000.00	2700000.0
Per cap income (Rs.)	399	7362.76	5326.65	600.00	50000.0
Per cap asset (Rs.)	399	64736.43	67422.58	1818.18	833333.3
Log income	399	10.51	0.63	7.78	12.61
Log asset	399	12.55	0.79	9.68	14.81
Log per cap income	399	8.72	0.60	6.40	10.82
Log per cap asset	399	10.76	0.80	7.51	13.63
Sickness in family(1=yes)	399	0.39	0.49	0.00	1.00
Income std. dev.	399	22299.04	44330.17	402.66	358209.1
Income coeff. of variation	388	0.39	0.16	0.09	0.95
Absolute risk aversion(*10-4)	399	0.11	0.17	0.00	2.00
Relative risk aversion coeff	399	2.05	1.48	0.00	4.00
Risk prone (1=yes)	399	0.98	0.13	0.00	1.00
Income difference	399	0.00	36194.45	-255900.00	47150.0

Risk prone: The family has suffered crop or cattle loss, major sickness, death in 1 year.

Table 6.13: Summary Statistics of Important Credit Rationing Variables (India)

Variable	Obs	Mean	Std. Dev.	Min	Max
Denied formal loan	399	0.44	0.50	0.00	1.00
Denied because of lack of collateral	399	0.46	0.50	0.00	1.00
Interest rate unaffordable (highrate1)	399	0.35	0.48	0.00	1.00
Likely to borrow more if interest rate is reduced (highrate2)	399	0.97	0.18	0.00	1.00
Credit constrained (Creditconstr1)	399	0.64	0.48	0.00	1.00
Credit constrained (Creditconstr11)	399	0.86	0.34	0.00	1.00
Predicted value of credit constrained (Pcreditconst)	384	0.65	0.27	0.02	1.00

Creditconstr1 : Denied loan + could not borrow desired amount of loan for education, health, consumption, farming and business purposes; from formal sources.
Creditconstr11: Creditconstr1 +Never got desired amount of loan .
Pcreditconst: Predicted value of credit constraint, obtained from regressing Creditconstr1 on a set of explanatory variables such as age, education, asset, preferences for formal loans etc.

Table 6.14: Summary Statistics of Important Credit Transaction Variables (India)

Variable	Obs	Mean	Std. Dev.	Min	Max
Whether any Debt Outstanding	399	0.81	0.39	0.00	1.00
Amount of Debt (Rs.)	336	15659.08	21430.80	0.00	200000.0
Formal Loan Percent	325	48.40	44.80	0.00	100.00
Informal Loan Percent	325	36.25	42.44	0.00	100.00
Informal loan Amount (Rs.)	325	4015.19	8477.11	0.00	84000.0
Formal Loan Amount (Rs.)	325	10382.46	18877.72	0.00	200000.0
Propensity of Formal Loan	325	0.59	0.49	0.00	1.00
Propensity of Informal Loan	325	0.52	0.50	0.00	1.00
Informal formal loan ratio	325	0.11	0.23	0.00	1.62
Loan for production	389	0.65	0.48	0.00	1.00
Loan for risk management	390	0.23	0.42	0.00	1.00
Default on informal loan	399	0.20	0.40	0.00	1.00
Delay on informal loan	399	0.61	0.49	0.00	1.00
Default on formal loan	399	0.23	0.42	0.00	1.00
Delay on formal loan	399	0.50	0.50	0.00	1.00
Delay or default on formal loan	399	0.63	0.48	0.00	1.00
Delay or default on informal loan	399	0.83	0.37	0.00	1.00
Prefer not to default on informal loan	399	0.80	0.40	0.00	1.00
Prefer informal loan	399	0.51	0.50	0.00	1.00
Informal loans are convenient	399	0.53	0.50	0.00	1.00
Community Pressure Reduces Default	399	0.63	0.48	0.00	1.00

Table 6.15: Summary Statistics of Important Social Preference Variables (India)

Variable	Obs	Mean	Std. Dev.	Min	Max
Risk share using gifts or loans	399	0.73	0.44	0.00	1.00
Trusts that informal loan will be rapid (trust1)	399	0.79	0.40	0.00	1.00
Will lend even does not trust that loan will be repaid(trust2)	399	0.45	0.50	0.00	1.00
Will lend or borrow even they have refused earlier (alt1)	399	0.79	0.41	0.00	1.00
Stronger version (and conditions) of (alt1)	399	0.27	0.45	0.00	1.00
Strong guilty feeling on defaulting informal loan	399	0.30	0.46	0.00	1.00
Strong guilty feeling on defaulting formal loan	399	0.32	0.45	0.00	1.00
Mutual min Reciprocity	399	0.51	0.50	0.00	1.00
Mutual max Reciprocity	398	0.64	0.48	0.00	1.00
Mutual max and Mutual Min Reciprocity	399	0.44	0.50	0.00	1.00

Table 6.16: Summary Statistics of Important Socio-Economic Variables (China)

Variable (India)	Obs	Mean	Std. Dev.	Min	Max
sex (Female=1)	741	0.10	0.30	0.00	1.00
Age	738	2.94	0.97	1.00	4.00
Education(1-7)	739	3.36	1.52	1.00	7.00
Education (1-4)	739	1.40	0.77	1.00	4.00
Household size	1540	4.39	1.54	0.00	21.00
Years of Farming	1538	27.35	13.14	0.00	70.00
Farm Size (mu)	1540	5.39	3.29	0.30	25.00
Income source(farm=1)	1540	0.42	0.49	0.00	1.00
Household Income (RMB)	1522	10559.52	8090.53	0.00	50000.0
Percent Farm income	1535	46.80	33.86	0.00	100.00
Household Asset Value (RMB)	1416	51112.29	44605.24	1000.00	500000.0
Per cap income (RMB)	1536	2707.55	2742.77	0.00	40000.0
Per cap asset (RMB)	1413	12625.41	11702.82	250.00	100000.0
Log income	1537	9.01	0.84	5.52	12.21
Log asset	1416	10.48	0.93	6.91	13.12
Log per cap income	1534	7.59	0.80	3.96	10.60
Log per cap asset	1413	9.06	0.93	5.52	11.51
Sickness in family(1=yes)	1540	0.19	0.40	0.00	1.00
Income std. dev.	1540	6625.39	74472.76	0.00	2323063.00
Income coeff. of variation	1469	0.31	0.16	0.00	0.99
Absolute risk aversion(*10-4)	1136	1.51	2.89	0.00	40.00
Relative risk aversion coeff	1136	2.77	1.52	0.00	4.00
Risk prone (1=yes)	741	0.77	0.42	0.00	1.00
Income difference	1522	0.00	7242.38	-38879.07	14847.46

Risk prone: The family has suffered crop or cattle loss , major sickness, death in 1 year.

Table 6.17: Summary Statistics of Important Credit Rationing Variables (China)

Variable	Obs	Mean	Std. Dev.	Min	Max
Denied formal loan	1530	0.27	0.44	0.00	1.00
Denied because of lack of collateral	521	0.65	0.48	0.00	1.00
Interest rate unaffordable (highrate1)	674	0.54	0.50	0.00	1.00
Likely to borrow more if interest rate is reduced (highrate2)	674	0.69	0.46	0.00	1.00
Credit constrained (Creditconstr1)	1540	0.36	0.37	0.00	1.00
Credit constrained (Creditconstr11)	1539	0.57	0.48	0.00	1.00
Predicted value of credit constrained (Pcreditconst)	660	0.57	0.13	0.20	0.83

Creditconstr1 : Denied loan + could not borrow desired amount of loan for education, health, consumption, farming and business purposes; from formal sources
Creditconstr11: Creditconstr1 +Never got desired amount of loan
Pcreditconst: Predicted value of credit constraint, obtained from regressing Creditconstr1 on a bunch of explanatory variables such as age, education, asset, preferences for formal loans etc.

Table 6.18: Summary Statistics of Important Credit Variables (China)

Variable	Obs	Mean	Std. Dev.	Min	Max
Whether any Debt Outstanding	1536	0.52	0.50	0.00	1.00
Amount of Debt (RMB)	1015	13165.81	26268.60	0.00	480000.0
Formal Loan Percent	809	34.72	42.00	0.00	100.00
Informal Loan Percent	809	63.92	42.30	0.00	100.00
Informal loan Amount (RMB)	800	8231.40	12475.78	0.00	150000.0
Formal Loan Amount (RMB)	800	7900.17	22005.97	0.00	398400.0
Propensity of Formal Loan	809	0.46	0.50	0.00	1.00
Propensity of Informal Loan	809	0.78	0.42	0.00	1.00
Log informal loan	624	8.68	1.17	4.61	11.92
Log formal loant	371	9.14	1.13	4.61	12.90
Informal formal loan ratio	791	1.46	3.31	0.00	50.00
Loan for production	1354	0.35	0.48	0.00	1.00
Loan for risk management	1354	0.22	0.41	0.00	1.00
Default on informal loan	1499	0.04	0.19	0.00	1.00
Delay on informal loan	1499	0.39	0.49	0.00	1.00
Default on formal loan	1485	0.02	0.15	0.00	1.00
Delay on formal loan	1540	0.14	0.35	0.00	1.00
Delay or default on formal loan	1501	0.39	0.49	0.00	1.00
Delay or default on informal loan	1511	0.45	0.50	0.00	1.00
Prefer not to default on informal loan	739	0.93	0.25	0.00	1.00
Prefer informal loan	674	0.72	0.45	0.00	1.00
Informal loans are convenient	739	0.82	0.38	0.00	1.00
Community Pressure Reduces Default	741	0.77	0.42	0.00	1.00

Table 6.19: Summary Statistics of Important Social Preference Variables (China)

Variable	Obs	Mean	Std. Dev.	Min	Max
Risk share using gifts or loans	741	0.67	0.47	0.00	1.00
Trusts that informal loan will be rapid (trust1)	1535	0.90	0.30	0.00	1.00
Will lend even does not trust that loan will be repaid(trust2)	1538	0.62	0.49	0.00	1.00
Will lend or borrow even they have refused earlier (alt1)	740	0.81	0.39	0.00	1.00
Stronger version (and conditions) of (alt1)	740	0.52	0.50	0.00	1.00
Strong guilty feeling on defaulting informal loan	1540	0.54	0.50	0.00	1.00
Strong guilty feeling on defaulting formal loan	1540	0.44	0.50	0.00	1.00
Mutual min Reciprocity	741	0.40	0.49	0.00	1.00
Mutual max Reciprocity	741	0.73	0.45	0.00	1.00
Mutual max and Mutual Min Reciprocity	1540	0.15	0.36	0.00	1.00

The estimation results of equation (6.18) are reported in Table 6.20. The estimation models for both the countries are quite significant, as Wald Chi square statistics are significantly high.

Also the variation of propensity of formal and informal loan with income is shown in Figure 6.4, for India, which shows that the propensity to choose formal loan increases with income and the propensity to choose informal loan decreases with income. In the case of China, this nature of association is not found to be significant.

Table 6.20: Multivariate Probit Estimation of Formal and Informal Loans

	India				**China**			
	Coef.	Z	Coef.	Z	Coef.	z	Coef.	Z
	Formal (yes=1)		Informal (yes=1)		Formal (yes=1)		Informal (yes=1)	
Sex (1=female)					-0.24	-0.9	0.40	1.38
Age	0.057	1.15	.02	0.46	-0.01	-0.03	0.07	0.16
Age sq	0.000	-0.8	.000	-0.57	-0.01	-0.08	0.00	0.05
Percent Farm income	0.01*	1.7	-.001	-0.22	0.00	-0.89	0.00	-1.73
Household size	0.09*	2.88	-.07*	-2.41	0.01	0.22	-0.06	-1.05
Education	0.36*	2.86	-.163	-1.52	0.10	1	-0.01	-0.09
Log asset	0.043	0.25	-.091	-0.57	0.45*	3.45	-0.20*	-1.83
Log income	0.48*	2.64	-.33*	-2.17	-0.19	-1.48	-0.03	-0.26
Prefer informal loan	-0.84*	-4.25	.17	1.09	-0.75*	-3.89	0.41*	2.73
Loan Production	1.17*	3.47	-.79*	2.67	-0.11	0.44	-0.93*	3.03
Loan Risk	0.43	1.17	-.005	0.02	-0.62*	2.11	-.31	0.93
region6	-0.282	-0.82	.084	0.27	-0.55*	-3.05	0.64*	3.83
region8	0.65*	2.08	-.05	-0.19				
region9	-0.94*	-3.47	.076	0.32				
Denied loan for collateral	-.24	1.1	.52*	2.71	-0.12	-1.11	0.15	0.85
Constant	-9.84*	-3.51	5.66*	2.33	-1.29	-0.7	2.15	1.27
Rho	-.77*	11.2			-.79*	11.2		

India : N = 314 ; Wald chi2(28) = 123.32; Prob > chi2 = 0.00;
China: N = 356; Wald chi2 (26) = 75.75; Prob > chi2 = 0.00 ;

Important findings from this estimation are discussed as following:

1. In the case of India families with higher income tend to prefer formal loan. However in the case of China the coefficient on the income is not significant and families with higher asset tend to prefer formal loan over informal loans. This is as per conjecture as families with higher income or asset are more capable of posting collateral and hence formal loan is accessible to them.

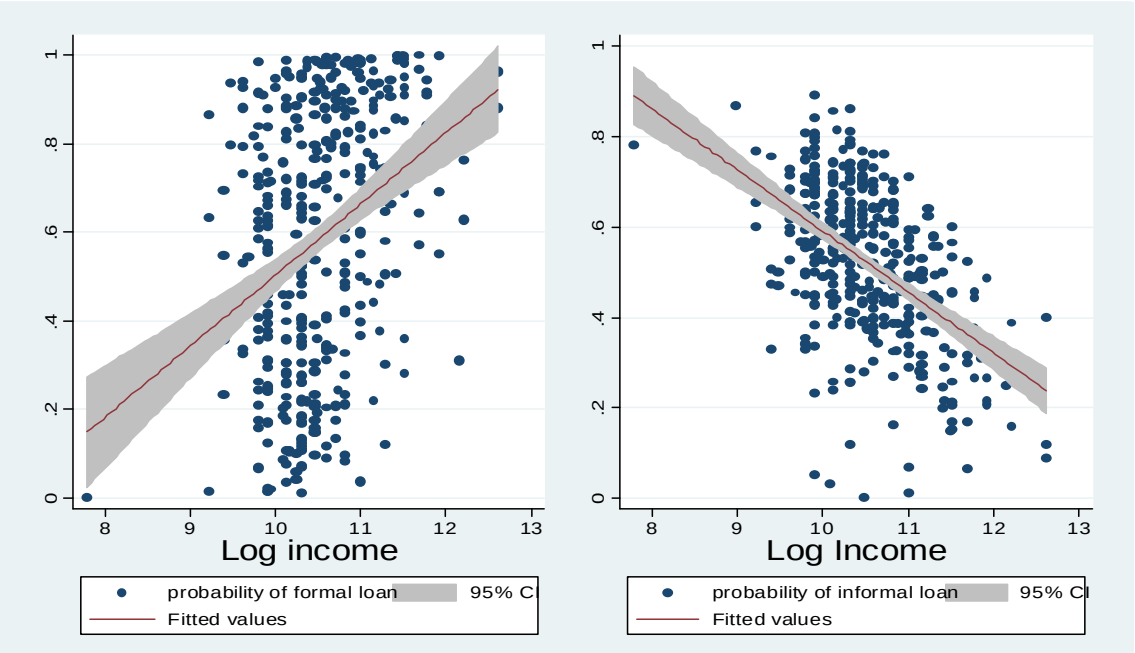

Figure 6.4: Variation of Propensity of Formal and Informal Loan with Income: India

2. Also more education is associated with higher propensity of formal loan and lower propensity for informal loan (coefficient not significant in the case of China) – again formal loans may be more accessible for families with more education.
3. In the case of India higher percentage of farm income is associated with higher propensity of formal loan. The reason may be that formal loans are mostly used for capital investment in farm activities and also for agriculture input requirements.
4. Family size is positively associated with higher propensity of formal loan. The bigger families may be able to post more collateral and also they may need more loan.
5. Other demographic variables, age and sex are not found to be significant explanatory variable for preferring formal or informal loan.
6. Formal loans seem to be motivated by production purposes (agriculture inputs, capital investments, house construction etc.) and informal loans seem to be motivated by risk management purposes (health, funeral, consumption etc.).

7. Propensity for informal loans is apparently higher for the families who have been denied formal loan for want of collateral.
8. The correlation coefficient (ρ) is negative and significant for both the countries– which validates our hypothesis that the two decisions are significantly correlated.

Overall it is inferred that – (i) informal loans are preferred by families having less assets and income, (ii) Informal loans are preferred by families who have been denied formal credit more often for lack of collateral, (iii) informal loans are of comparatively smaller size, (iv) more informal loans are taken by families who prefer taking loans from friends and relatives, and (v) informal loans are more often used for risk management purposes.

Next, risk sharing motive of informal loan transactions will be explored econometrically.

6.4.2 Econometric Model of Risk Sharing and Identification Strategy

Important elements of risk sharing are guided by the program (6.5) and the equations (6.7, 6.9, and 6.12) and the minimum repayment equation; which solve for the values of default rate, loan amount, and additional repayment amount, and minimum repayment amount (θ_s,B,C_1,and R) in equilibrium. Hence ideally the data on loan transactions among friends and relatives after some shocks are needed to test for the risk sharing. Also observations on repayment and default are needed. However such requirements are quite stringent and collecting such data is greatly time consuming and arduous. Hence to overcome this complexity, we simply estimate linear estimation model variant of equations 6.9. Equation (6.9) gives expression for optimal loan amount, which is a function of several variables, such as, income level of self, partner's income level, default rates, minimum repayment amount and other constraint

coefficients. Equation 6.11 (equation 6. 9 with particular assumption on preferences) is reproduced below.

$$B = \frac{y2(1+\nu 1(2-\beta^2)) - (\mu + \nu 2(2-\beta^2))y1}{(\mu + \nu 2(2-\beta^2) + 1 + \nu 1(2-\beta^2))} : \ \mu = 0, \nu 1 = 0, \text{ and } \nu 2 > 0 \quad \ldots (6.11)$$

Here, $\nu 2$ is a constraint coefficient that depends on repayment amounts R and C1, E default rate θ, asset endowments and risk parameters as discussed earlier.

quation (6.11) can be used to form an estimation equation as following

$$B = \frac{y2(1+\nu 1(2-\beta^2)) - (\mu + \nu 2(2-\beta^2))y1}{(\mu + \nu 2(2-\beta^2) + 1 + \nu 1(2-\beta^2))} \ ; \mu = 0, \nu 1 = 0, \text{and } \nu 2 > 0 \text{ (as shown earlier) } ..(6.11)$$

Hence taking log on both sides, we get

log (B) = log (y2 – e1y1) – log(1+e1) ; where e1 = ν2(2-β^2) …(6.19)

The constraint coefficient ν2 is a function of minimum repayment R, additional repayment C1, default level θ, income endowments etc. as discussed earlier.

Further equation 6.19 can be simplified into estimation equation as following

$$\log(\text{Informal loan}) = \alpha + \beta \log(\text{income difference}) + \gamma \log(\text{asset}) + \delta \text{ default} + \mu X + \varepsilon$$

$$\text{and} \quad \text{default} = \lambda Z + \eta \quad : (\text{defaulted on informal loan} = 1) \quad \ldots (6.20)$$

As default on informal loan itself is explained by several variables.

Where income difference = Average Village Income – Family Income

And X is a set of other control variables such as, age, education, risk perception, preference for lending and borrowing from friends and relatives. Z is a set of explanatory variable that explain default probability, such as income, savings, guilty feelings, community pressure, preference for not defaulting on such loans etc.

The identification strategy used here is that, lower the income of a family from the average village income is, more the informal borrowing will be done by that family for

the risk management. This is the best approximation devised here in absence of data on partner's income with him a particular household is doing financial transactions.

Our conjecture is that the informal loan will increase with increasing income difference, $\beta > 0$ is hypothesized to give evidence for risk sharing opportunities. A graphical depiction of this has been shown in Figure 6.5. Also the size of informal loan is conjectured to decrease with increasing default rate.

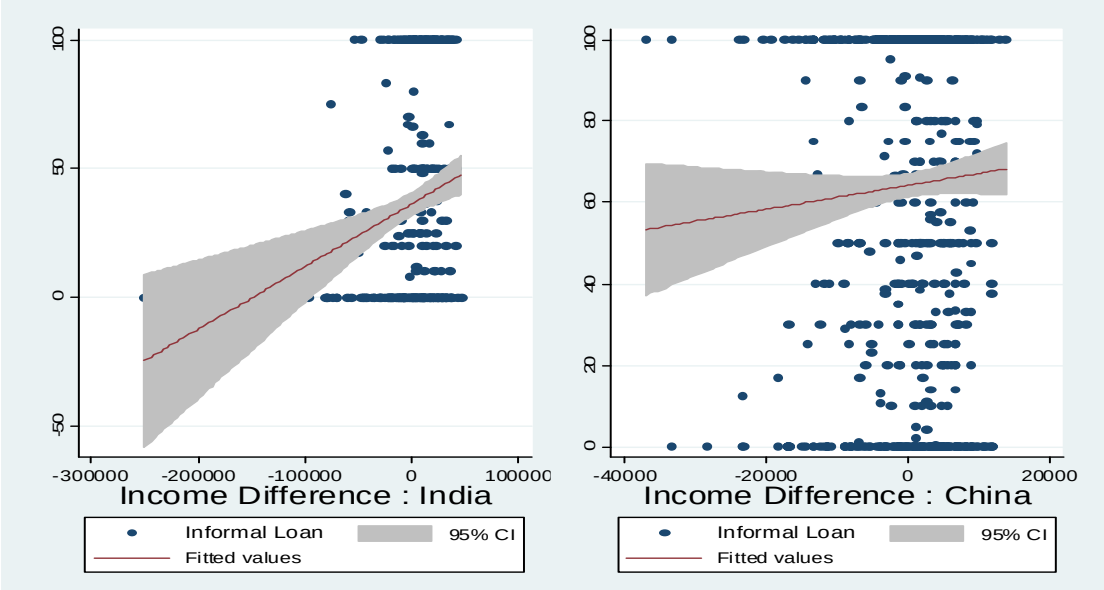

Figure 6.5: Informal Loan vs. Income Difference (Mean village income- family income)

6.4.2.1 Estimation of the Model

The default propensity in the first equation is a variable which is practically influenced by several variables such as income, saving, risk perceptions, guilty feelings, preference for not defaulting, risk shocks, illness, etc. Hence the assumption of exogeneity for this variable may not be appropriate. In such a situation the parameters estimated using OLS method may not be consistent and so not properly identified. To address the problem of endogeneity of an explanatory variable, instrumental variable method is usually used. Before discussing these matters, the OLS results of estimation of equation (6.20) are reported in Table 6.21. In this regression our main interest lies

in the coefficient of log of income difference variable, β. We reject (at 10% significance) the null hypothesis of β=0 in favor of β>0 only in the case of China. However, the coefficient of the variable, Delay or default on informal loan is significantly positive – which is against the conjecture.

Table 6.21: OLS Results of Regression of Informal Loan Amount

Dependent Variable : log informal	**India**		**China**	
Loan Amount	Coef.	T	Coef.	T
Sex (1=Female)			0.145	0.39
age	0.07	1.28	-0.634	-0.92
Age sq	0.00	-1.38	0.118	0.93
Household size	-0.02	-0.65	-0.129	-1.41
education	-0.08	-0.57	-0.044	-0.27
Percent farm income	0.00	0.46	-0.007	-1.49
Log asset	0.21	1	-0.131	-0.68
Risk share	0.13	0.65	0.239	1.01
Trust	0.14	0.56	-0.732*	-1.96
Prefer friend relative	0.07	0.31	0.474*	1.84
Abs risk coefficient	-1.49*	-1.87	-0.273*	-3.03
Log income diff (β)	**0.54**	**1.26**	**5.07**	**1.66**
Loan production	-1.17*	-3.05	-0.817*	-2.08
Loan risk management	-0.21	-0.5	-0.001	0
Financial Reserves	-0.08	-0.69	-0.011	-0.12
region6	0.66	1.51	0.953*	3.84
region8	-0.41	-1.07		
region9	0.65*	1.88		
risk1	0.27	0.35	-0.228	-0.82
Denied collateral	0.65*	2.56	0.204	0.73
Delay or default on informal Loan	1.65*	6.99	0.838*	3.68
_cons	-11.08	-1.54	-60.134	-1.56

India : N = 323; F(21, 301) = 8.46 ; Prob > F = 0.00; Adj R-squared = 0.32
China: N = 276; F (20, 255) = 8.37; Prob > F = 0.00; Adj R-squared = 0.35

Consistent estimation of the coefficients requires that E(X'ε) =0. This assumption gets Substantially violated when – (i) any of the explanatory variables is affected by the explained variable because of simultaneity; and (ii) any of the explanatory variables is not strictly exogenous and is explained by other variables which may be correlated

with the error term. Here delay or default on informal loan variable arguably falls in the second category and hence the OLS estimations may not be consistent. Also the endogeneity test (Wu–hausman, and Durbin, Wu- Hausman tests) of "Delay or default on informal loan" has been reported there in Table 6.22. Evidently in the case of India the null hypothesis of exogeneity of this variable is rejected, hence instrumental variable method is appropriate here. However in the case of China the null hypothesis is accepted, so ordinary least square (OLS) parameters may be consistent here.

Table 6.22: Endogeneity Test of "Delay or default on informal loan"

Variable : Delay or Default on Informal Loan Loan	India		China	
	Wu- Hausman Test (p value)	Durbin-Wu-Hausman chi-sq test	Wu- Hausman Test (p value)	Durbin-Wu-Hausman chi-sq test
F / Chi-sq stat.	F(1,299) =7.75	Chi-sq(1) =8.15	F(1,251)=1.57	Chi-sq(1) =1.69
p value	0.005	0.004	0.21	0.19

Note: Inference : Null hypothesis of exogeneity of "Delay or default on informal loan" is rejected in the case of India and not rejected in the case of China

Hence the estimation model (6.20) consisting of two equations is estimated using Limited Information Maximum Likelihood Model (LIML), a variant of instrumental variable method[39]. In this method the estimation is done in two stages. In the first stage the endogenous explanatory variable "Delay or default on informal loan" is regressed on a set of exogenous variables which includes the excluded instruments (not used in the second stage regression). The excluded instruments used are – sickness, food scarcity, guilty feeling, prefer not to default, community pressure, and altruistic preferences. The results are reported in Table 6.23. In the case of both the countries the exclusion criterion is nearly satisfied as p values are .07 and .06 for China and India respectively, and both the regressions are statistically significant. Even the instruments seem to be weak but to achieve consistency in the estimation of

[39] Followed from Baum, C.F., et al (2007), and Greene (2006).

parameters, this is the best we can do here. Our main interest lies in the estimation of second stage equation. However it can be reasonably inferred that higher opportunity of risk share, higher productive usage of loan, lower sickness level, and guilty feelings for default are associated with lower propensity of delay or default on informal loans.

Table 6.23: First Stage Results of Regression Model 6.20 (IV – LIML Method)

Dependent variable	India		China	
Delay or default on informal loan	Coef.	T	Coef.	T
Sex (1=Female)			0.032	0.31
age	0.005	0.33	0.149	0.79
Age sq	0.000	-0.61	-0.033	-0.97
Household size	-0.008	-0.84	-0.020	-0.81
education	0.002	0.06	-0.021	-0.49
Percent farm income	-0.002	-1.14	0.001	0.64
Log asset	0.080	1.47	-0.027	-0.51
Log income	0.006	0.09	0.101	1.34
Risk share	-0.041	-0.79	-0.129*	-1.95
Prefer friend relative	0.126*	2.06	0.108	1.48
Abs risk coefficient	0.294	1.51	0.005	0.2
Log income diff	0.300*	2.48	1.510	1.13
Loan production	-0.202*	-2.08	-0.159	-1.48
Loan risk management	-0.044	-0.43	-0.017	-0.14
Financial Reserves	0.016	0.57	-0.020	-0.75
region6	-0.253*	-2.02	0.040	0.54
region8	0.232*	2.16		
region9	0.057	0.49		
Denied collateral	0.098	1.57	0.112	1.45
Delay formal	-0.145*	-2.1	0.146*	2.14
Sickness (1=yes)	-0.043	-0.71	0.135*	1.85
Food scarcity (1=yes)	-0.013	-0.22	-0.006	-0.07
Guilty feeling(1=yes)	-0.116	-1.67	-0.173*	-2.68
Altruistic Preferences	-0.088	-1.52	-0.041	-0.66
Prefer not to Default	0.025	0.33	-0.151	-0.89
Community pressure	0.132*	1.95	0.144*	1.92
_cons	-4.134*	-1.96	-19.184	-1.11

China: N= 272; F (29, 242) = 1.64; Prob > F = 0.02; Centered R2 = 0.16; Uncentered R2 = 0.56; F (9, 242) = 1.80; Prob > F = 0.07
India: N= 323; F (30, 292) =3.42; Prob> F=0.00; Centered R2 = 0.26; Uncentered R2 = 0.75; F (9,292) =1.81; Prob>F =0.06;

In the second stage regression, the predicted values of "Delay or default on informal loan" are used as an explanatory variable. Here the dependent variable is log of informal loan amount. The second stage estimation results are reported in Table 6.24.

Table 6.24: Second Stage Results of Regression Models 6.20 (IV-LIML Method)

Dependent variable	**India**		**China**	
Log informal loan	Coef.	Z	Coef.	Z
Sex (Femal=1)			0.00	0
Delay or default on informal loan	**-2.248**	**-1.448**	**0.74**	**0.79**
Age	0.085	1.164	-0.69	-1.01
Age sq	-0.001	-1.497	0.14	1.08
Household size	-0.037	-0.743	-0.14	-1.67
Education	-0.051	-0.287	-0.07	-0.46
Percent farm income	-0.008	-1.039	-0.006	-1.53
Log asset	0.529*	1.822	-0.14	-0.77
Risk share	-0.042	-0.157	0.19	0.76
Trust	0.044	0.140	-0.74*	-1.95
Prefer friend relative	0.337	1.048	0.47*	1.85
Abs risk coefficient	-0.183	-0.170	-0.26*	-3.08
Log income diff : β	**1.945***	**2.971**	**5.71***	**1.95**
Loan production	-1.461*	-2.527	-0.90*	-2.19
Loan risk manage	-0.321	-0.596	-0.08	-0.19
Financial Reserves	0.067	0.463	-0.01	-0.15
region6	-0.715	-1.023	1.00*	4.18
region8	0.419	0.813		
region9	-0.245	-0.537		
Denied collateral	1.089*	2.955	0.30	1.08
Delay formal	-2.308*	-5.986	-0.70*	-2.69
_cons	-31.503*	-3.078	-67.81*	-1.85

China : N = 272; F(21, 250) = 7.73; Prob > F = 0.00 ;Centered R2 = 0.42 ; Uncentered R2 = 0.9509 Sargan Statistic of over identification test of all instruments: 2.187; Chi-sq(8) P-val = 0.97
India: N=323; F (22,300) =5.05; Prob>F=0.00; Centered R square = -0.05;; Uncentered R square= 0.89; Sargan Statistic of over identification test of all instruments: 5.52; Chi-sq (8) P-val = 0.70

The regressions for both the countries are statistically significant. Also Sargan's statistics for test of over identification leads to acceptance of null hypothesis of validity of instruments. In this regression our main interest lies in the coefficient of

log of income difference variable, β. Evidently for both the countries we reject the null hypothesis of $\beta=0$ in favor of $\beta>0$. Also as per conjecture the coefficient of the variable "Delay or default on informal loan" is negative in the case of India, but not significant. In the case of China, it is positive but not significant.

Essentially the significantly negative coefficient (β) on the "log income difference" in the case of both the countries suggest that risk sharing motives significantly influence informal loans transactions in rural areas of developing countries. Further, it can be reasonably inferred that higher preference of informal loan, lower productive usage of loan, lower values of collateral posting ability, are associated with higher informal loan amounts.

6.5. Conclusion

It has been emphasized that large numbers of families in rural areas of developing countries engage in informal lending and borrowings among friends and relatives, and informal debts constitute a large percentage of total loan portfolios of these people. Many of these families depend on such borrowing as they are credit rationed in the formal market and also many families prefer informal loans. It has been observed that in both the countries more than 70 percent and 90 percent families have engaged in gift and loan transactions respectively in emergencies. This demonstrates that people do share risk on a large scale and moreover preference for loan transaction dominates.

Analysis of household survey data from India and China about informal loans reveal that– (i) these are preferred by families having less assets and income, (ii) these are preferred by families who have been denied formal credit more often for lack of collateral, (iii) these loans are of comparatively smaller size, (iv) these loans are often taken by families who prefer taking loans from friends and relatives, and (v) informal

loans are more often used for risk management purposes. These findings have important policy implications.

The main objective of this chapter is to analyze the significance and underlying motives of such informal financial transactions. In the literature risk sharing motive has been advanced as an important explanation of this. Pursuing that line of research, a detail analytics of risk sharing motive for informal lending and borrowing among friends and relatives has been presented, and useful results are obtained. This line of reasoning explains it as a sub game perfect equilibrium outcome of repeated interactions among the households. The primary contribution of this chapter is to characterize the loan amount, state contingent repayments, and default rates in equilibrium. Also a simple test is suggested to get inferences on risk sharing motives.

These results are empirically tested using household survey data from China and India. To test for risk sharing ideally the data on loan transactions among friends and relatives after some shocks are needed. Also observations on repayment and default are needed. However, collecting such data is greatly time consuming and arduous. To resolve this problem, a simple strategy is devised, that may identify risk sharing motive. The identification strategy employed is that lower the income of a family from the average village income is more the informal borrowing will be done by that family for risk management. This is the best approximation achieved in the absence of availability of data on partner's income with whom a particular household is doing financial transactions. For both the countries significant evidences are obtained related to risk sharing motives explaining informal lending and borrowing.

However, for improved inferences on the risk sharing motives of informal loan transactions following suggestions are made:

1. For better inferences on risk sharing motives, data on loan transactions among friends and relatives after some non covariant shocks are needed. Also observations on repayment and default are needed.

2. Also in a cross section data, we are not able to control for the unobserved heterogeneities of the households. The availability of panel data may resolve the omitted variable bias caused by this inadequacy.

3. Well measured values of the coefficients of relative risk aversion and absolute risk aversion of the families (as suggested in the Chapter 5) may help us in understanding the nature of associations of risk aversion of the families and informal loan transaction among friends and relatives.

Despite these limitations, this chapter provides helpful insights on risk sharing motives of informal lending and borrowing among close acquaintances of the families living in rural areas of developing economies.

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Chapter 7: The Economics of Informal Lending and Fairness Motive

In the rural areas of developing countries informal lending and borrowing among friends and relatives are observed to be quite prevalent. Risk sharing motive has been advanced as an important explanation of such informal financial transactions. However, risk sharing motive does not include social preferences such as altruism, trust, reciprocity and fairness, which seem to be important for these financial transactions. The primary contribution of this chapter is to investigate the fairness reciprocity, in terms of fairness equilibrium framework (Rabin, 1993), as an important motive underlying the informal financial transactions among relatives and friends. Here outcomes are mutual –max when each person maximizes the other's material payoffs and mutual-min when each person minimizes the other's payoff. Analytical results are obtained to explain the informal borrowing and lending as a mutual-max fairness equilibrium outcome. Using household survey data from China and India and suitable econometric methods, the empirical findings suggest mixed evidences on fairness reciprocity as underlying motives for these informal financial transactions. A preference for mutual-max reciprocity is found to be positively associated with informal loan amount. Significant evidences obtained for mutual-max reciprocities, suggest that fairness can be advanced as an important motive for explaining informal financial transactions. However mixed evidences are obtained for mutual-min reciprocity. In totality Rabin's model of fairness and reciprocity when applied to explain the informal lending and borrowing is not perfect but this seems to be an excellent starting place to incorporate social preferences for explaining the informal lending and borrowing among relatives and friends. This investigation supplements the existing knowledge in this field.

7.1. Introduction

In the developing countries particularly in the rural areas people face severe challenges in arranging finance for consumption and production purposes. The standard assumptions of complete markets including that of credit and insurance markets generally do not hold well in reality. The price mechanism particularly in credit and insurance market is intrinsically limited by transaction costs and information and enforcement costs[40]. Consequently fulfillment of effective demand of credit and insurance is not attained. In response to these imperfections, several institutional mechanism have developed in these areas such as, sharecropping (Cheung 1969, Stiglitz 1974), informal lending and insurance arrangements (Udry 1994, Coate, S. and Ravallion, M. 1993, Eswaran and Kotwal 1989, Ligon, Thomas, and Worrall 2002) etc.

The vigorous coexistence of formal and informal credit market in rural areas is well documented[41]. The commercial banks and rural cooperatives predominantly constitute formal credit institutions that usually mobilize savings and advance loans. They advance loans mainly for productive usages at low interest rates, but also they insist on collaterals, which poor families are often unable to post. In the informal credit markets, money is lent by private individuals – moneylenders, traders, landlords, friends, relatives etc. The loan contracts are quite diverse in nature. Moneylenders generally advance credits at high interest rates, the traders and landlords advance loans at low rate of interests in lieu of reciprocal services to be rendered to them, and friends and relatives advance credits at low interest rates as a mutual support and insurance arrangements.

[40] See Hoff, Braverman, and Stiglitz (1993) for more on this.
[41] See Bell (1990) for a good reference.

The main objective of this chapter is to develop an analytical framework to investigate the underlying motives for such financial transactions among friends and relatives in the rural areas of developing countries, and also to empirically test some of the results obtained from this analysis.

This study is important for following reasons:

(i) The families in these areas mostly depend on agriculture and ancillary activities. The household survey data from China and India reveals that farm income constitutes about 48 and 57 percent of family income respectively in China and India. The coefficient of variation of farm income in these countries are usually high, it is estimated around 34 percent. This creates substantial uncertainties in their income. So insurance and credit becomes an important input for livelihood for most of the families. Families need credit for consumption, production, and other investment purposes.

(ii) Further formal credit markets - banks and rural credit cooperatives (RCC) are not well developed in such areas. In these areas informal borrowing constitutes a large portion of total borrowing. The Data reveals that informal borrowing constitutes about 64 and 37 percent of total borrowing respectively in the case of China and India.

(iii)So also the insurance markets are not well functional in these areas. For example, in the case of India 90 percent families show their willingness to buy crop insurance, whereas only 34 percent families have actually bought this, in the case of China these percentages are 75 and 18 respectively. In absence of well functioning insurance markets, the importance of credit is further enhanced (Eswaran and Kotwal, 1989).

(iv) Also the data reveals that large percentages (50 percent) of the families actually prefer informal loans to formal loans.

Household surveys were conducted in rural areas of China (in years 2007 and 2008) and India (in year 2008-09). About 1500 families in China and 400 families in India

were surveyed. The survey questionnaires are designed to elicit responses of families related to; (i) credit rationing problems which they face, (ii) how it affects their livelihood choices, (iii) how they respond to overcome this problem, and (iv) the extent, types and motives for financial transactions among friends and relatives.

The surveys data are used in this chapter to analyze the informal lending results.

Some of the initial findings are mentioned here that considerably motivates this chapter.

1. About 45 percent families in India and 30 percent families in China have been denied loan from RCC or banks, because of various reasons as summarized in Table 7.1. Evidently lack of collateral seems to be major reason for denial of loan.

Table 7.1: Reason for Denial of Loan from RCC or Bank

Variable : Denied loan due to	Mean: India (N=180)	Mean : China (N=524)
Lack of collateral (1=yes)	.50	.65
Yield risk in crop (1=yes)	.1	.04
Fail to replay past loan (1=yes)	.32	.18
Not trustworthy (1=yes)	.25	.45
Low income (1=yes)	.16	.49

Further about same percentages of families in India and China told that they could not get needed amount of loan from these sources for various consumption and production purposes. These facts demonstrate that large number of families in these economies face substantial credit rationing from formal sources.

2. Table 7.2 summarizes the composition of loans of the families in these two countries. The loans obtained from banks and RCC belong to formal loan and the loans borrowed from friends and relatives belong to informal loan. Following facts are evident- (i) large percentage of the families depends on informal loans; (ii) informal loans constitute substantial part of total loan portfolios; and (iii) families belonging to lower quintiles of assets depend more on informal loans.

3. Loans are taken not only for production purposes, but also to meet emergent needs such as, consumption, health, funeral expenses etc. In both the countries almost 25 percent of the borrowings seem to be done for such purposes, as shown in Table 7.3.

Table 7.2: Composition of Loan Portfolio of Families in India and China (percentages)

	India				China			
Quintile Assets	Formal Loan	Informal loan	N	Mean (Informal>0)	Formal Loan	Informal Loan	N	N (Informal>0
1	32.82	35.5	72	.50	22.6	75.7	246	.84
2	36.91	48.38	48	.66	33.3	66.0	104	.79
3	46.29	44.66	67	.55	41.3	57.7	138	.73
4	61.95	28.37	70	.32	38.8	60.1	128	.77
5	63.22	26.2	57	.47	54.3	44.2	133	.66
Total	48.40	36.29	314	.52	35.9	62.8	749	.77

Table 7.3: Purpose of Borrowing by Families (percentages)

	India			China		
Quintile Assets	Loan risk	Loan production	N	Loan risk	Loan production	N
1	35	59	97	31	59	406
2	29	55	58	22	65	165
3	17	75	79	20	70	249
4	23	68	86	16	75	221
5	07	84	71	12	80	217
Total	23	68	391	22	68	1258

Evidently in both the countries larger percentages of families in lower quintiles of assets have borrowed to meet the urgent needs.

4. Limited access and availability of formal loans may compel the families to depend on informal borrowings. Also the data reveals that large percentages (50 percent) of families actually prefer informal loans to formal loans.

Informal financial transactions among close acquaintances (friends, and relatives) are usually characterized by (Udry, 1994; Fafchamps, 1999; Lund and Fafchamps, 2003): (i) no prescription of formal contracts; (ii) no explicit interest rates; (iii) state

contingent repayment of loans, (iv) role reversal of agents as borrowers and lenders; and (vi) less importance of information asymmetry.

Investigation of financial transaction among relatives and friends is an evolving field of study. In the literature, risk sharing and consumption smoothing motives are given as important explanations for such financial transactions. This line of reasoning has been investigated in detail in the previous chapter.

So far the informal loan transactions have been explained as a device to resolve commitment problems in mutual risk sharing. It has been shown as a subgame perfect outcome of repeated interactions of risk averse and credit constrained households in quest of risk sharing and consumption smoothing. The analysis has been made in the standard economic framework in which material self interest is considered as the sole motivation of all economic transactions. However a growing body of evidence in literature suggests that people are also strongly motivated by social preferences such as altruism, trust, fairness, and reciprocity; which can not be ignored in social interactions[42].

The risk sharing motive does not take care of many social preferences such as altruism, trust, reciprocity and fairness. Hence only risk sharing motive for informal loan transactions appears to be an incomplete explanation. We need to look beyond the pecuniary aspects of such transactions. The primary contribution of this chapter is to explain these social preferences as the driving force for sustaining the informal financial transactions among relatives and friends, using fairness equilibrium framework proposed by Rabin (1993). Here outcomes are mutual –max when each person maximizes the other's material payoffs and mutual-min when each person minimizes the other's payoff. And hence if mutual-max equilibrium dominates the

[42] For a good review see Fehr and Schimdt (2006)

mutual-min equilibrium, then fairness can be advanced as an important motive for explaining such informal financial transactions.

The chapter is organized as following. Section 2 briefly presents a review on the importance of social preferences in economic transactions. Section 3 uses fairness equilibrium (people like to help those who are helping them, and to hurt those who are hurting them) framework proposed by Rabin (1993) to come up with alternative explanation of such informal loan transactions. A formal analysis of informal lending and borrowing among relatives and friends using the fairness equilibrium framework is presented and useful results are obtained in this section.

Household survey data from China and India have been used to conduct empirical investigation into the significance of these results. The inferences and evidences are discussed in section 4. Suitable econometric methods and appropriate identification strategies have been proposed to get evidences on the results related to fairness reciprocation (mutual-max and mutual-min) motives related to informal lending and borrowing. Significance on preferences for mutual-max reciprocations is obtained in the estimation model of informal loan amounts. This finding suggests that mutual-max fairness can be advanced as an important motive for explaining informal financial transactions. Section 5 concludes with important observations.

7.2. Social Preferences and Economic Transactions

Normally the economic analysis follows the dictum of self utility maximization, without caring for others material payoffs, behaviors or intentions – that allows parsimonious models with tractable solutions. This way of analysis predicts behavior well in many contexts particularly when markets are competitive and transaction costs are ignorable – such as experimental researches related to transactions in competitive markets (Smith and Williams, 1990), one sided auction with independent private

values (Cox and Oaxaca, 1996) etc. However when markets are incomplete or transaction costs are non-ignorable, this framework predicts poorly. Arrow (1974) described trust as a positive externality and observed that in presence of transaction costs trust influences almost every economic transaction. Further Bowles and Gintis (1993) observed that in incomplete markets transactions, outcomes depend on participants' level of altruism, strategic behavior, sentiments, and other social and cultural preferences. Experimental researches have reported findings where the outcomes are at variance with the predictions[1] - such examples include ultimatum games (Slonim and Roth, 1998), voluntary contribution to public goods game or free riders game (Fehr and Schimdt, 1999) and many variants of trust and investment games (Cox 2006, Cox 2004, and Cox et al. 2001).

Such departures from pure self interests have stimulated models of social preferences. In literature the two approaches to incrporate social preferences are discussed below[43].

1. Outcome based approach in which people are concerned about payoffs of others. In this approach transaction are motivated to reduce differences in payoffs between oneself and others. The choices may be Pareto improving or Pareto damaging depending upon self's reference point. Important studies that underline such social preferences include; inequity aversion preferences (Fehr and Schmidt, 1999), equity, reciprocity and competition (ERC) preferences (Bolton and Ockenfels, 2000), altruistic preferences and quasi-maximin preferences (Andreoni and Miller, 2002). Quasi maximin preferences Combines the assumption that people are motivated to maximize the payoff to the minimum-payoff person with the desire to increase total payoffs yields. Such preferences do not induce Pareto damaging behavior.

[43] Followed from Charness and Rabin (2002).

2. Intentions based approach in which agent cares about the intentions behind the behaviors of others and reciprocates based on beliefs about whether the other player is treating her fairly. The beliefs are used as arguments in utility functions[44]. Hence this approach is different from normal game theories in which beliefs affect strategies which affects payoff indirectly. Here a person derives utility both from material payoff and from her belief that she is treated kind and moreover she is able to treat other kindly (unkindly) given that she is treated kindly (unkindly) . Rabin (1993) in his seminal paper proposes fairness equilibrium that demonstrates intentions based reciprocity for simple two-player normal form game. Dufwenberg and Kirchsteiger (2004) and Falk and Fischbacher (2006) have extended Rabin (1993) model to explain behavior in sequential games.

Before proceeding further, definitions of these social preferences are presented: [45]

Following from Andreoni and Miller (2002), Charness and Rabin (2002); Altruism is defined as a form of unconditional kindness. A person is altruistic if the first partial derivative of u(x1, …xN) with respect to x1,…,xN is strictly positive, where x1,…,xN are allocations of individuals 1,..,N. The opposite of this is envy.

A conditional form of altruism / envy is inequity aversion – Fehr and Schmidt (1999), Bolton and Ockenfels (2000), Charness and Rabin (2002). An individual is inequity averse if, in addition to his material self-interest, his utility increases if the allocation becomes more equitable.

Positive reciprocity is a motivation to respond kindly if others have treated one kindly. Negative reciprocity is a motivation to respond unkindly, even harming oneself; if other person's intentional behavior was perceived to be harmful. Rabin (1993) using these social preference formalized fairness equilibrium. Reciprocity in

[44] For theoretical formalization see, Geanakoplos, Pearce and Staccheti (1989).
[45] Followed from, Cox (2006), and Fehr, and Schimdt (2006), chapter 8

one shot interaction as defined above differs basically from cooperative or punitive behavior in repeated interactions which is motivated by future material gains. Also type based reciprocity has been studied (Levine, 1998)-where type of person (not intentions) influences preferences.

Trust is basically an agent's belief about the behavior of other person. Trusting action creates the possibility of mutual benefit or risk of loss to the trustor depending on whether the other person cooperates or defects.

Essentially in addition to the material resources, a person may also care about[1]: (i) the material resources allocated to others, (ii) the fairness of the behavior of agents, (iii) whether the agents have selfish, altruistic, or fair minded preferences.

7.3. Informal Lending and Borrowing and Fairness Equilibrium

The empirical evidence about informal loan transactions among friends and relatives has been reported earlier. The credit rationed families engage in such transactions to help each other in the time of need or also they prefer such transactions. Such choices may also be driven by above described social preferences. As discussed earlier incorporation of these social preferences in analysis comes at a cost – the model is less parsimonious and solutions may not be clean. Important social preferences underlying such transactions may be trust and reciprocity and analysis of trust or reciprocity requires introductions of belief (also notion of perceived intentions) into theory. In this chapter, I am using the fairness equilibrium framework proposed by Rabin (1993) to incorporate trust and reciprocity to explain the informal loan transactions among friends and relatives. These informal loan transactions can be considered as an outcome of fairness game - simply implying that people like to reciprocate in a manner which either maximizes the aggregate payoff (being kind to each other – mutual-max) or minimizes the aggregate payoff (being hostile to each other – mutual-

min). Rabin (1993) showed that every mutual-max or mutual-min Nash equilibrium is fairness equilibrium.

This framework has been used for its multiple appealing features:

1. It realistically captures the essence of transactions. People generously help each other if each one expect other to be kind (close acquaintances), but if each one expect other to defect (distant neighbors) then they won't be helping each other. The person with lower income in one period gets help from other person with higher income in that period has kind feeling for him and so reciprocates positively when the other person needs help.
2. It precisely defines reciprocity and provides insights of behaviors and outcomes.
3. It investigates motivations of hostile behaviors when the other agent takes unfair actions or display unfair intentions.
4. It formalizes and demonstrates the existence of fairness equilibria.
5. Most importantly this framework is analytically tractable to handle beliefs, and notions of reciprocity; needed to analyze the equilibrium outcomes.

This framework has also some deficiencies:

1. It provides distinctive insights when transactions are limited to smaller values.
2. It lacks consistency, as monetary payoff ($) is added to the dimensionless kindness function [-1, 0.5] in the utility term. This becomes less important when the payoffs are high.
3. It provides cardinal properties to utility function.
4. Multiplicity of equilibria leads to poor prediction of outcome.

However the informal loan transactions considered here are usually of small amounts, thus the social preferences reflected in kindness functions maintain their significance. Hence despite these shortcomings, the fairness equilibrium framework seems to be

most promising way to investigate the importance of trust and reciprocity motives underlying the informal loan transactions.

7.3.1 Findings from Survey in India and China

Before analytical framework of fairness motives for informal financial transactions is presented, the major findings from the surveys related to various aspects of informal financial transactions among friends or relatives are reported in Table 7.4. Evidently preferences for loan transactions are much higher than for gifts transactions in both countries. In emergency situations large numbers of families do give and receive gifts, although the loan transactions dominate. Also major fractions of families prefer loan transactions in both normal and emergency conditions. Large fractions of families also agree that community pressure helps in reducing defaults.

Table 7.4: Important Aspects of Informal Financial Transactions

Variable (note: mean value shows the fraction of respondents who agree to the question: 1=yes)	Mean Value : India (N=400)	Mean Value: China (N=739)
Gift transactions among friends and relatives	.67	.25
Gift transactions(stronger version: both gave and received)	.36	.05
Loan transactions among friends and relatives	.97	.94
Loan transactions(stronger version: both lent and borrowed)	.60	.70
Gift for emergency purposes	.71	.59
Loan for emergency purposes	.96	.98
Prefer loan for emergency purposes	.88	.82
Prefer loan for general purposes	.73	.84
Prefer not to default on such loans	.80	.93
Community pressure helps in reducing default	.76	.63

Further important motivations for such financial transactions are reported in Table 7.5. Evidently large percentage of families prefer to borrow (lend) from friends and relatives. Substantial percentages of families find this convenient and also loan and interest repayment terms are found to be flexible. Considerable percentages of families

do such financial transactions as they trust that loans will be repaid. But also a good percentage of families agree to give loans even they do not trust that loan will be repaid and also a good percentage of families agree to borrow or lend even they have been refused earlier by their friend and relatives. Noteworthy findings are that substantially large percentages of families believe in mutual-max reciprocity which dominates the mutual-min reciprocity.

Table 7.5: Important Motivations of Informal Financial Transactions

Variable (note: mean value shows the fraction of respondents who agree to the question: 1=yes)	Mean Value : India (N=400)	Mean Value: China (N=739)
Prefer to borrow from friends or relatives	.50	.72
Flexibility in loan repayment	.87	.93
Flexibility in interest amount repayment	.83	.76
Borrowing from friends or relatives convenient	.89	.96
Trust that loans given to friends or relatives will be repaid	.79	.90
Loans given even not trust that loan will be repaid	.45	.63
Agree to borrow or lend even they have refused earlier	.27	.52
Mutual-max reciprocity	.64	.73
Mutual-min reciprocity	.51	.40

These findings clearly convey the message that the social preferences such as altruism, trust, reciprocity and fairness play significant roles in explaining informal financial transactions among friends and relatives.

7.3.2 Description of Important Elements of Fairness Equilibrium

As laid out in section 4, let us consider, there are two households (agents) 1 and 2. In every period t they get stochastic income endowments denoted by $\{y^1{}_t\}_{t=0}^{t=T}$ and $\{y_t^2\}_{t=0}^{t=T}$ respectively with mean $y^1{}_m$ and $y^2{}_m$ and variance σ^1 and σ^2. The endowment process is assumed to be stationary. The families enter into an agreement to mutually lend and borrow an amount equal to x_t. Starting in any period, the family which gets the lower income borrows from the household which gets higher income. The

borrowing household makes state contingent repayment in the next period and this process keep repeated over time. The history of mutual utility maximizing outcomes generates kind feelings and kind reciprocations (mutual-max) takes place. But if there is a history of deviation then it may generate hostile feelings and then hostile reciprocation (mutual -min) takes place.

Rabin (1993, p.1282) used three stylized facts in his paper as mentioned here: (A) People are willing to sacrifice their own material well-being to help those who are being kind. (B) People are willing to sacrifice their own material well-being to punish those who are being unkind. (C) Both motivations (A) and (B) have a greater effect on behavior as the material cost of sacrificing becomes smaller.

Further the equilibrium outcome is characterized as following:

(i) Any Nash equilibrium that is either a mutual-max outcome or mutual-min outcome is also fairness equilibrium.

(ii) If material payoffs are small, then roughly an outcome is a fairness equilibrium if and only of it is a mutual-max or a mutual-min outcome.

(iii) If material payoffs are large, then roughly an outcome is a fairness equilibrium if and only of it is a Nash equilibrium.

Further following concepts are explained to describe the fairness equilibrium outcome

1.Strategies $a_1 \in S_1$ and $a_2 \in S_2$ represent the strategies of two players. $b_1 \in S_1$ and $b_2 \in S_2$ represent, respectively player 2's belief about the strategy chosen by player 1, and vice versa. $c_1 \in S_1$ and $c_2 \in S_2$ represent player 1's belief about what player 2 believes player 1's strategy is, and vice versa.

2. Kindness Functions: Player 1's kindness to player 2 is expressed by

$$f_1(a_1,b_2)=\frac{\pi_2(b_2,a_1)-\pi_2^e(b_2)}{\pi_2^h(b_2)-\pi_2^{\min}(b_2)} \qquad ...(7.1)$$

where $\pi_2(b_2,a_1)$ represents the payoff of player 2.

Set $\Pi(b_2)$ is defined as: $\Pi(b_2)\equiv\{(\pi_1(a,b_2),\pi_2(b_2,a)\mid a\in S_1\}]$

$\pi_2^h(b_2)$ is player 2's highest payoff and $\pi_2^{\min}(b_2)$ is her lowest payoff in $\Pi(b_2)$.

Let $\pi_2^l(b_2)$ be the lowest payoff of player 2 in the set $\Pi(b_2)$ which is Pareto efficient.

then $\pi_2^e(b_2)=(\pi_2^h(b_2)+\pi_2^l(b_2))/2$

if $\pi_2^h(b_2)-\pi_2^{\min}(b_2)=0, then\ f_1(a_1,b_2)=0$

Also if $\pi_2(b_2,a_1)=\pi_2^e(b_2)$, then $f_1=0$ and $f_1<0$ implies that player 1 is giving less than equitable payoff to player 2. $f_1>0$ implies that player 1 is giving player 2 more than her equitable payoff.

And player 1's belief about kindness of player 2 is given by

$$\tilde{f}_2(b_2,c_1)\equiv\frac{\pi_1(c_1,b_2)-\pi_1^e(c_1)}{\pi_1^h(c_1)-\pi_1^{\min}(c_1)}$$

$$if\ \pi_1^h(c_1)-\pi_1^{\min}(c_1)=0, then\ \tilde{f}_2(b_2,c_1)=0 \qquad ...(7.2)$$

Also $f_1(a_1,b_2)$ and $\tilde{f}_2(b_2,c_1)$ lie in the interval [-1,1/2]

3. Utility Functions: The payoffs in such a framework depend not only on players actions (conventional game theory) but also depend on player's beliefs. The utility function which incorporates both her material utility and shared notion of fairness is defined as

$$U_i(a_i,b_2,c_1)\equiv\pi_i(a_i,b_j)+\tilde{f}_j(b_j,c_i).[1+f_i(a_i,b_j)] \qquad ...(7.3)$$

Player i's utility is moderately increased or decreased by her belief of kindness with player j treats her and then in response to that the way player i reacts. For example if

player 1 believes that player 2 is treating her badly - $\tilde{f}_2(b_2, c_1)$ <0, then player 1 also reciprocates by choosing an action a_1 such that $f_1(.,.)$ is low or negative. As kindness functions are bounded above and below, such construction of utility function reflects the stylized fact C: notion of fairness is significant for small material payoffs and as the material payoffs increases the reciprocation guided by fairness loses its significance.

4. Definition of Fairness Equilibrium: The pair of strategies $(a_1, a_2) \in (S_1, S_2)$ is a fairness equilibrium if, for i =1, 2, j ≠ i

(1) $a_i \in \arg\max_{a \in S_I} U_i(a_i, b_j, c_i)$; and (2) $c_i = b_i = a_i$ ...(7.4)

5. mutual –max and mutual-min outcome

A strategy pair $(a_1, a_2) \in (S_1, S_2)$ is a mutual - max outcome if, for i = 1,2, j ≠ i,
$a_i \in \arg\max_{a \in S_i} \pi_j(a, a_j)$

A strategy pair $(a_1, a_2) \in (S_1, S_2)$ is a mutual - min outcome if, for i = 1,2, j ≠ i,
$a_i \in \arg\min_{a \in S_i} \pi_j(a, a_j)$

6. Fairness equilibrium and Nash equilibrium: Rabin (1993) has formalized several propositions related with the concept of fairness and Nash equilibrium. We mention here three of those. Proposition 1 says that, if (a_1,a_2) is a Nash equilibrium, and either a mutual-max outcome or a mutual-min outcome, then (a_1,a_2) is a fairness equilibrium. Proposition 2 says that, every fairness equilibrium outcome is either strictly positive (f_i >0) or weakly negative (f_i <=0). Proposition 3 says that for any outcome (a_1, a_2) that is either a strictly positive mutual-max outcome or a strictly negative mutual-min outcome, there exists an $\bar{X}$, such that, for all $X \in (0, \bar{X})$, (a_1, a_2) is a fairness equilibrium in G(X).

7.3.3 Analysis of Loan Transactions Using Fairness Equilibrium

Now the fairness equilibrium outcome in two period interactions between the households 1 and 2 is considered. Suppose in period 0 household 1 gets endowment y_0^1 ($y_0^1 < \bar{y}^1$) and household 2 gets endowment y_0^2 ($y_0^2 > \bar{y}^2$). To smooth his consumption or to meet other needs the household 1 borrows from household 2 amount x (assuming $y_0^2 > y_0^1$). Now in next period (period 1) assume that household 1 gets better endowment y_1^1 ($y^1{}_1 > \bar{y}^1$) so that she can repay the loan. It is further assumed that: $(y_0^2 > y_1^2, y_0^1 < y_1^1; y_0^2 > y_0^1, y_1^1 > y_1^2)$ - i.e. in date 0 household 2 gets better endowment and household 1 gets poorer endowment and in date 1 the situation reverses. Now the household has two choices of action: either repay (a=R) amount αx (α≥1) or default (a=D). We also assume that both households have a well behaved utility function say, log utility function. The payoff over two periods is written as:

$$\begin{aligned}
\pi_1 &= \{\ln(y_0^1 + x) + \beta \ln(y_1^1 - \alpha x); \alpha \geq 1 && \text{if a = R} \\
&= \{\ln(y_0^1 + x) + \beta \ln(y_1^1) && \text{if a = D} \\
\pi_2 &= \{\ln(y_0^2 - x) + \beta \ln(y_1^2 + \alpha x) && \text{if a = R} \\
&= \{\ln(y_0^2 - x) + \beta \ln(y_1^2) && \text{if a = D}
\end{aligned} \qquad \ldots(7.5)$$

Now let us analyze this model for mutual-min and mutual-max outcome. In conventional game theoretic analysis, in one shot, the situation is similar to a continuous strategy prisoner's dilemma game – the household 1 chooses to default in period 1 (dominant strategy) and for a=D, household 2 maximizes her payoff by setting x=0. So (a=D, x=0) is a dominant strategy Nash equilibrium. And if we characterize this outcome in the fairness setup then, the lender believes that borrower is intentionally cheating in the next period and so in the first period he feels hostile and intentionally does not lend, even this may hurt him later. In this equilibrium both

players feel hostile to each other and so the kindness functions ($f_1(\ )$, and $f_2(\ )$) assume value of -1, that leads to the payoff functions as that in conventional game theory and the mutual-min outcome is realized. Then using proposition 1, it is characterized as mutual-min fairness equilibrium. These findings are reported in Result 7.1.

Result 7.1: Using conventional game theoretic framework, in one shot game of borrowing/lending and repayment the Nash equilibrium is (a=D, x=0), which is a mutual-min outcome and so also a mutual-min fairness equilibrium.

Now the possibility of mutual-max outcome in this one shot game is considered, which will yield positive fairness equilibrium. For that the kindness functions are evaluated

$$when\ \mathrm{a=R},\ \mathrm{f_1}=\frac{\pi_2(.,.)-\pi_2^e(.,.)}{\pi_2^h(.,.)-\pi_2^{\min}(.,.)}=\frac{\pi_2^h\ (.,.)-(\pi_2^h(.,.)+\pi_2^l=\pi_2^{\min})/2}{\pi_2^h(.,.)-\pi_2^{\min}(.,.)}=1/2$$

$$when\ \mathrm{a=D},\ \mathrm{f_1}=\frac{\pi_2(.,.)-\pi_2^e(.,.)}{\pi_2^h(.,.)-\pi_2^{\min}(.,.)}=\frac{\pi_2^{\min}\ (.,.)-(\pi_2^h(.,.)+\pi_2^l=\pi_2^{\min})/2}{\pi_2^h(.,.)-\pi_2^{\min}(.,.)}=-1/2 \quad ..(7.6)$$

Now it is assumed that agent 2 can maximally lend half of the difference of endowments in the date 0 (maximum kindness by agent 2), and minimum amount is zero. Hence

$$when\ \max.\text{lending},\ \pi_1^h(.,.)=\left\{\ln(y_0^1+(y_0^2-y_0^1)/2)+\beta\ln(y_1^1-\alpha(y_0^2-y_0^1)/2)\right\};\alpha\geq 1$$

$$\text{when}\ \ \min.\text{lending},\ \pi_1^{\min}(.,.)=\left\{\ln(y_0^1)+\beta\ln(y_1^1)\right\}$$

$$when\ \mathrm{a=R},\ \pi_1^{\mathrm{e}}=\left\{\ln(y_0^1+(y_0^2-y_0^1)/2)+\beta\ln(y_1^1-\alpha(y_0^2-y_0^1)/2)\right\}+\left\{\ln(y_0^1)+\beta\ln(y_1^1)\right\}/2$$

$$when\ \mathrm{a=D},\ \pi_1^{\mathrm{e}}=\left\{\ln(y_0^1+(y_0^2-y_0^1)/2)+\beta\ln(y_1^1)\right\}+\left\{\ln(y_0^1)+\beta\ln(y_1^1)\right\}/2$$

$$So,\ \text{when a=R},\ \ \pi_1(.,.)=\left\{\ln(y_0^1+x)+\beta\ln(y_1^1-\alpha x)\right\}\quad \text{and}$$

$$\mathrm{f_2}(.,.\mid a=R)=\frac{\pi_1(.,.)-\pi_1^e(.,.)}{\pi_1^h(.,.)-\pi_1^{\min}(.,.)}=\frac{\left\{\ln(y_0^1+x)+\beta\ln(y_1^1-\alpha x)\right\}-\pi_1^e\mid R\}}{\left\{\ln(y_0^1+(y_0^2-y_0^1)/2)+\beta\ln(y_1^1)\right\}-\left\{\ln(y_0^1)+\beta\ln(y_1^1)\right\}}$$

$$=\quad\frac{\left\{\ln(y_0^1+x)+\beta\ln(y_1^1-\alpha x)\right\}-\pi_1^e\mid R\}}{\ln((y_0^1+y_0^2)/2y_0^1)}$$

$$when\ \mathrm{a} = \mathrm{R}, U_2 = \{\ln(y_0^2 - x) + \beta \ln(y_1^2 + \alpha x) + 1/2[1 + \frac{\{\ln(y_0^1 + x) + \beta \ln(y_1^1 - \alpha x)\} - \pi_1^e \mid R\}}{\ln((y_0^1 + y_0^2)/2y_0^1)}]\}$$

Now the household 2 will maximize its utility by optimally choosing x such that

$$\frac{\partial \mathrm{U}_2}{\partial x} = 0 \Rightarrow \frac{-1}{y_0^2 - x} + \frac{\beta\alpha}{y_1^2 + \alpha x} + \gamma[\frac{1}{y_0^1 + x} - \frac{\alpha\beta}{y_1^1 - \alpha x}] = 0; \text{ where } \gamma = \frac{1}{2\ln((y_0^1 + y_0^2)/2y_0^1)}$$

$$\Rightarrow \frac{\beta\alpha}{y_1^2 + \alpha x^*} + \frac{\gamma}{y_0^1 + x^*} = \frac{1}{y_0^2 - x^*} + \frac{\alpha\beta\gamma}{y_1^1 - \alpha x^*} \quad ;\ \gamma = \frac{1}{2\ln(1/2 + y_0^2/2y_0^1)} \qquad ...(7.7)$$

Equation (7.7) is both necessary and sufficient condition for maximization, subject to constraint that the borrower repays the amount in the next period.

$$U_1(a = R) \geq U_1(a = D) \text{ for } \mathrm{x} = \mathrm{x}^* \qquad ...(7.8)$$

$$\Rightarrow \{\ln(y_0^1 + x) + \beta \ln(y_1^1 - \alpha x)\} + (\tilde{f}_{2|a=R})(1 + f_1^*) \geq \{\ln(y_0^1 + x) + \beta \ln(y_1^1)\} + (\tilde{f}_{2|a=D})(1 + f_1^*)$$

As previously derived, $(\tilde{f}_{2|a=R}) = 1/2$, and $(\tilde{f}_{2|a=D}) = -1/2$

$$\Rightarrow \{\ln(y_0^1 + x) + \beta \ln(y_1^1 - \alpha x)\} + 1/2(1 + f_1^*) \geq \{\ln(y_0^1 + x) + \beta \ln(y_1^1)\} + (-1/2)(1 + f_1^*)$$

$$\Rightarrow \beta \ln(y_1^1) - \beta \ln(y_1^1 - \alpha x) \leq (1 + f_1^*)$$

$$\Rightarrow \beta(\ln \frac{y_1^1}{y_1^1 - \alpha x}) \leq (1 + f_1^*): \quad \text{Here } \mathrm{f}_1^* = \frac{\pi_2^*(.,.) - \pi_2^e(.,.)}{\pi_2^h(.,.) - \pi_2^{\min}(.,.)}$$

note that the maximum value of $f_1^* = 1/2$, and the minimum

value of $\mathrm{f}_1^* = -1/2$. Hence minimum value of Right Hand Side $= 1/2$. So if $\beta = .8$, and $\alpha = 1$ (zero interest rate), then maximum value of x which satisfies this is

$$\mathrm{x}_{\max} = \begin{cases} .46y_1^1 & \text{for } \mathrm{f}_1^* = -1/2 \\ .85y_1^1 & \text{for } \mathrm{f}_1^* = 1/2 \end{cases} \qquad ...(7.9)$$

These values are quite reasonable. Intuitively the kindness value, demonstrated by the borrower (by not defaulting) and perceived by the lender, encourages him to lend.

Similarly the kindness value, demonstrated by the lender (by lending) and perceived by the borrower, encourages him not to default. Hence when both the borrower and lender have kind feelings for each other, maximum lending takes place.

Now getting explicit expression for x* using equation (7.7) appears cumbersome. But we can characterize the solution, which throws useful insights. The values of parameters are such that, $\alpha \geq 1$, $\beta < 1$, and γ is a monotonically decreasing function of ratio y_0^2 / y_0^1 (when $y_0^2 / y_0^1 = 1$, $\gamma = \infty$, $y_0^2 / y_0^1 = 2$, $\gamma = 1.23$, $y_0^2 / y_0^1 = 3$, $\gamma = 0.72$ and so on). Let us consider the extreme case of $\gamma = 0$ (i.e. y_0^2 / y_0^1 = very large) – then

$$x^* = \frac{y_0^2 \beta\alpha - y_1^2}{\alpha(1+\beta)} > 0 \text{ for } y_0^2 >> y_1^2 \qquad ...(7.10)$$

Further if $\beta = 1$, and $\alpha = 1$, and symmetric income process, i.e. $y_1^2 = y_0^1$

then $x^* = x_{\max} = \frac{y_0^2 - y_1^2}{2} = \frac{y_0^2 - y_0^1}{2}$

Further the left hand side (L.H.S.) of equation (7.7) is a monotonically decreasing function of x, at x=0, L.H.S. = $\frac{\beta\alpha}{y_1^2} + \frac{\gamma}{y_0^1}$ and as x increases upto x_{max} (x_{max} $= (y_0^2 - y_0^1)/2$) it decreases continuously and monotonically; and the right hand side (R.H.S.) is a monotonically increasing function of x. At x=0, R.H.S.= $\frac{1}{y_0^2} + \frac{\alpha\beta\gamma}{y_1^1}$ and as x increases till x_{max}, it increases continuously and monotonically. The L.H.S. sums up value of marginal utility gained from receiving loan (by agent 1) and from getting repayments –by agent 2. The R.H.S. sums up value of marginal utilities lost from giving loan (by agent 2) and from making repayments – by agent 1. Now with our assumptions on endowments and parameters we can reasonably have ($\frac{\beta\alpha}{y_1^2} + \frac{\gamma}{y_0^1} > \frac{1}{y_0^2} + \frac{\alpha\beta\gamma}{y_1^1}$) and hence the R.H.S. curve and L.H.S. curve will intersect at a

positive value of x* and so the solution exists such that $x^* \in [0, x_{max}]$. This is shown in figure 7.1.

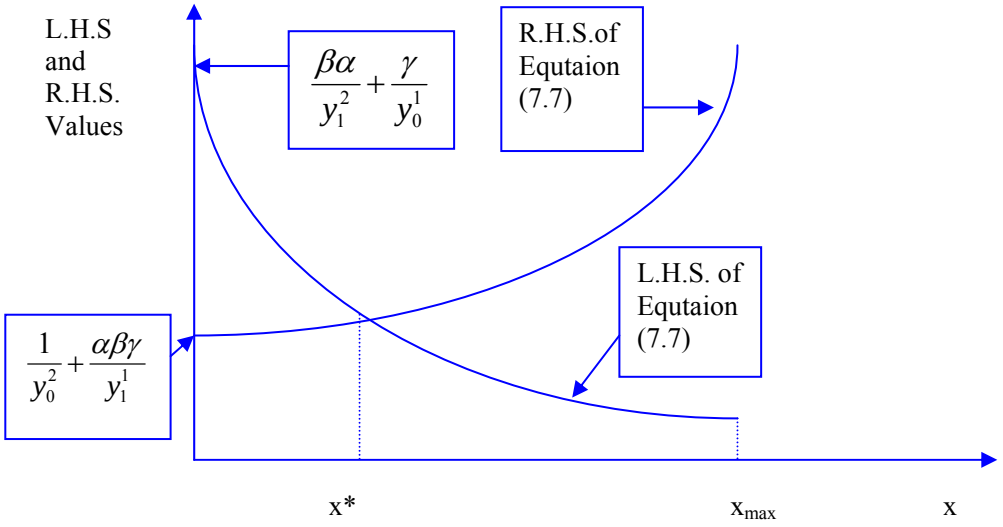

Figure 7.1: Fairness Equilibrium in One Shot Borrowing- Lending Game

Assuming a symmetric case of endowments of agent 1 and agent 2 in date 0 and date 1; *i.e.* $y_0^1 = y_1^2; y_1^1 = y_0^2$ and also assuming $\alpha = 1$ (zero interest rate); equation (7.7) yields

$$\frac{\beta\alpha}{y_1^2 + \alpha x} + \frac{\gamma}{y_0^1 + x} = \frac{1}{y_0^2 - x} + \frac{\alpha\beta\gamma}{y_1^1 - \alpha x}$$

$$\Rightarrow \frac{\beta}{y_1^2 + x} + \frac{\gamma}{y_1^2 + x} = \frac{1}{y_0^2 - x} + \frac{\beta\gamma}{y_0^2 - x} \quad \Rightarrow \quad \frac{\beta + \gamma}{y_1^2 + x} = \frac{\beta\gamma + 1}{y_0^2 - x} \qquad ...(7.11)$$

$$\Rightarrow (\beta + \gamma)(y_0^2 - x) = (\beta\gamma + 1)(y_1^2 + x)$$

$x^* = \frac{(\beta + \gamma)y_0^2 - (\beta\gamma + 1)(y_1^2)}{(\beta + \gamma) + (\beta\gamma + 1)} > 0$; and $y_0^2 > y_1^2; 1 \geq \beta$; these values always guarantee $x^* > 0$, when $(\beta + \gamma) \geq (\beta\gamma + 1)$ and this implies $\gamma \geq 1$. This leads to the following requirement,

$$\gamma = \frac{1}{2\ln(1/2 + y_0^2/2y_0^1)} \quad \text{and} \quad \gamma \geq 1 \quad \Rightarrow \quad \frac{y_0^2}{y_1^2} \in [1, 2.30] \qquad ...(7.12)$$

So, this simplification (symmetric case) tells that the informal loan transaction under the framework of fairness equilibrium works well if the ratio of endowments of agents

in good and bad time is bounded between 1 and 2.30. This result is driven by the reasoning that their will be increasing temptation to default with larger sums of money in one shot game. Hence too much income differences may not sustain the informal loan transaction process.

This is illustrated by a simple example as following.

Let $\beta = 0.90$, $y_0^2 = 1000$, $y_1^2 = 500$; This implies $\gamma = 1.23$. Then equation (7.11) yields, $x^* = 250$. Next we check for the satisfaction for the repayment condition (7.8);

$$i.e., \quad \beta(\ln \frac{y_1^1}{y_1^1 - \alpha x}) \le (1 + f_1^*) \quad \Rightarrow \quad 0.90(\ln(1000/750)) = 0.30 \le (1 + f_1^*)$$

The above condition holds, as mimumum value of $f_1^* = -1/2$ and maximum value is 1/2 in the present case. Hence (a = R, $x^* = 250$) - which is a mutual - max outcome, is a fairness equilibrium using Proposition 3 of Rabin(1993).

In Figure 7.2 the values of left hand side (L.H.S.) and right hand side (R.H.S.) of equation (7.11) is plotted against x and evidently $x^* = 250$ is obtained.

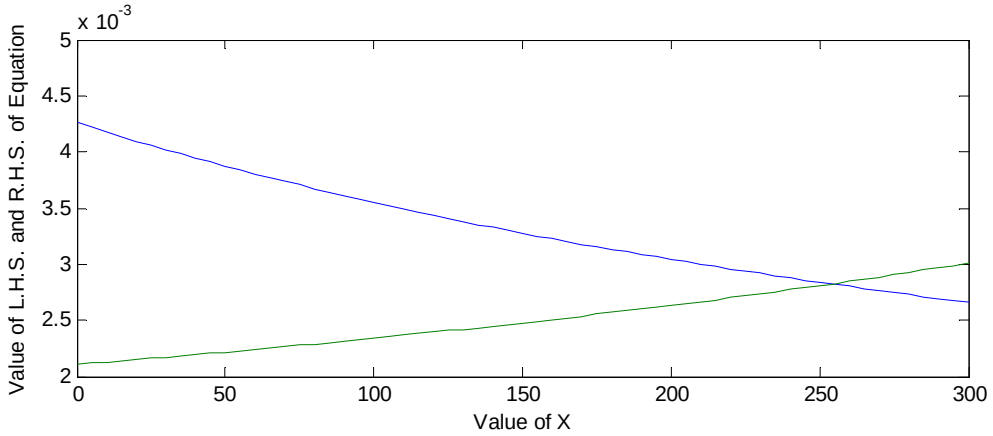

Figure 7.2: Value of Loan Amount in Mutual-max Equilibrium

The value of $x^*=250$, for a high patience factor $\beta = .90$, matches with $x_{optimum} = 250$ associated with complete consumption smoothing.

Also the comparative statics of x* with respect to γ (implicitly with respect to $\frac{y_0^2}{y_1^2}$) is examined. The equation (7.11) implies

$$x^* = \frac{(\beta+\gamma)y_0^2 - (\beta\gamma+1)(y_1^2)}{(\beta+\gamma)+(\beta\gamma+1)} \quad ; \text{where } \gamma = \frac{1}{2\ln(1/2 + y_0^2/2y_0^1)}; \text{ Let } y_0^2/y_0^1 = e$$

$$\Rightarrow x^* = y_1^2[\frac{(\beta+\gamma)y_0^2/y_1^2 - (\beta\gamma+1)}{(\beta+\gamma)+(\beta\gamma+1)}] = y_0^1[\frac{(\beta+\gamma)e - (\beta\gamma+1)}{(\beta+\gamma)+(\beta\gamma+1)}] \; ; (\text{since } y_1^2 = y_0^1) \quad ..(7.13)$$

Here as γ varies, income ratio e also changes; $e = 2\exp(.5/\gamma) - 1$. Now taking differential is cumbersome, so the variation of x * with γ is shown graphically in Figure 7.3.

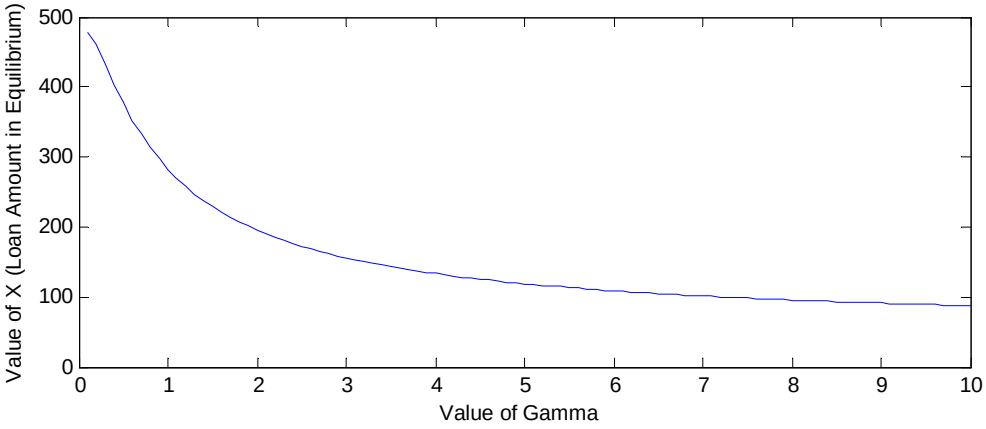

Figure 7.3: Variation of mutual-max Loan Amount with factor γ

In the above computation, y^2_0 =1000 is fixed and y^1_0 is allowed to vary with γ. Evidently x* is found to be decreasing with higher values of γ. The above finding is also quite intuitive: as γ increases, $\frac{y_0^2}{y_0^1}$ decreases and so the lending and borrowing level in equilibrium decreases. These findings are presented in Result 7.2.

Result 7.2: In the fairness equilibrium framework, with reasonable assumptions on endowments of the agents in the two periods, the lending and borrowing sustains in even one shot game. Strictly positive mutual-max outcome (a=R, x=x*>0) is obtained as a fairness equilibrium (not possible in conventional game theory without a punishment clause). In this mutual-max outcome both households have kind feelings

for each other. Moreover the mutual-max fairness equilibrium works well if the ratio of endowments of agents in good and bad time is bounded between 1 and 2.30.

Further if $\frac{y_0^2}{y_1^2} = \frac{y_0^2}{y_0^1} \approx 2$, then the lending/borrowing amount (x*) is quite close to that of perfect consumption smoothing level. Further x* tends to increase with the ratio $\frac{y_0^2}{y_0^1}$ in its neighborhood. Evidently the mutual-max fairness equilibrium (a=R, x*=250) Pareto dominates the mutual-min fairness equilibrium (a=D, x*=0).

Hence when the endowment differences between the households and across periods is bounded (say the upper ratio =2.3), then motivated by the feeling of helping each other (may be an outcome of good trust building exercise), lending/ borrowing and repayment process sustains on its own without any punishment mechanism. Hence trust and benevolent feelings may be an important driving force of informal loan transactions among family members and friends.

7.4. Empirical Analysis on Fairness Motive and Informal Lending and Borrowing

As discussed earlier risk sharing motive may not in itself be complete explanation for the informal financial transactions. People are also strongly motivated by social preferences such as altruism, trust, fairness, and reciprocity; which can not be ignored in social interactions. In this subsection significance of these social preferences will be investigated empirically, particularly in contexts of the results 7.1 and 7.2.

Result 7.1 asserts that in one shot game of borrowing/lending and repayment the Nash equilibrium is (a=D: default, x=0: no lending), which is a mutual-min fairness equilibrium. Here both participants feel hostile to each other. Result 7.2 asserts other way that the lending and borrowing sustains even in one shot game; strictly positive mutual-max outcome (a=R: repayment, x=x*>0: positive lending) is obtained as a mutual-max fairness equilibrium. In this mutual-max outcome both households have

kind feelings for each other. Moreover the mutual-max fairness equilibrium works well if the ratio of endowments of agents is bounded between 1 and 2.30, as too much income differences may prompt bigger default with larger sums of money in one shot game. Further x* tends to increase with the income ratio of lender and borrower.

In the survey conducted in India and China, specific questions were asked to families that would reveal whether the families have preferences for mutual-max or mutual-min social interactions. The mean values of mutual-max and mutual-min across the quintiles of assets for both counties are reported in Table 7.6. Overall about 75 percent families in China (65 percent in the case of India) demonstrate preferences for mutual-max reciprocation, whereas these percentages for mutual-min reciprocation are about 40 percent and 50 percent for China and India respectively. These findings suggest that mutual-max equilibrium is more likely to evolve in the fairness equilibrium context and it may be an important explanation of risk sharing behaviors.

Table 7.6: Percentages of Families Prefer to behave as Mutual-max and Mutual min

Asset quintile	India			China		
	mutual-max	mutual min	N	mutual-max	mutual min	N
1	.71	.62	101	.77	.47	165
2	.58	.43	60	.68	.44	88
3	.59	.49	79	.73	.41	162
4	.54	.41	88	.65	.32	152
5	.75	.57	72	.77	.35	176
Total	.64	.51	400	.73	.40	743

The preferences for mutual-max and mutual-min reciprocations are not mutually exclusive. As reported in Table 7.7, many families reveal preferences for both type of reciprocations and also good number of families show preferences for neither of these. In fact in both the countries only about 8 percent of the respondents prefer to exclusively behave as mutual min, and about 40 percent respondents in China and 20 percent respondents in India prefer to exclusively behave as mutual-max. This finding

is not in contradictions with the stylized facts A, B, and C of Rabin (1993). It appears that preference for mutual-max dominates the preference for mutual-min behavior.

Table7.7: Categorization of Families along mutual-max and mutual-min (percentages)

mutual-max	mutual-min (China)			mutual-min (India)		
	0	1	Total	0	1	Total
0	(0,0)19.44	**(0,1)8.07**	27.51 (208)	28.75	**7.25**	36.00 (144)
1	**(1,0)40.61**	(1,1)31.9	72.49 (508)	**20.00**	44.00	64.00 (256)
Total	60.1(454)	39.9(302)	100.0 (756)	48.75	51.25	100 (400)

7.4.1 Econometric Model and Identifications Strategies of Fairness Reciprocities

The previous paragraphs show preliminary evidence on domination of mutual-max preferences that may explain the significance of social preferences in informal borrowing and lending. Here the same will be investigated econometrically. Equation (7.9) predicts that maximum informal lending in mutual-max case will be, $x_{max} = .85y^1_1$ (y^1_1 = income of borrower in good period); Table 7.8 reports the mean and maximum of ratio of informal debt and income. Ignoring few outliers, the mean value of these ratios are .12 and .81 respectively for India and China and maximum values are respectively .80 and 4.8. The high value of maximum value of ratio obtained for China, may be because of some of incomes reported by the families may be low belonging to bad periods. Overall the prediction matches satisfactorily with the data.

Table 7.8: Average and Maximum Values of Ratio of Informal Debt and Income

	India (N=183)				**China (N=340)**			
Variable	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Informal debt:1	4221.12	8047.32	0	50000	6349.74	9350.59	0	81600
Income: 2	36854.27	19553.16	2400	92000	11052.60	7497.24	250	50000
Ratio (1/2)	0.12	0.23	0	0.8	0.81	1.22	0	4.8

Before discussing the empirical evidence on nature of associations of mutual-max and mutual-min reciprocations with informal borrowing outcomes, first the empirics of mutual-max and mutual-min will be investigated.

7.4.1.1 Empirics of mutual-max and mutual-min fairness

The preferences for mutual-max and mutual-min reciprocations are guided by kindness functions specified by equations (7.6). In that equation important variables are incomes of the borrower and lender, discount factor, repayment rates etc. Here agnostic of any particular functional form, we simply investigate the nature of association of important explanatory variables with mutual-max and mutual-min reciprocations, using following estimation models.

Each of these reciprocations can be estimated using following equations.

$$M_{\max} = 1((\mathrm{M}^{*}_{\max} = \mathrm{X}_{\max}\beta_{\max} + \varepsilon_{\max}) > 0) \quad : \varepsilon_{\max} \approx N(0, \sigma^{2}_{\max}) \qquad ...(7.14)$$

Here $M^{*}_{\max}$ is the latent propensity of Mutual Max. The observed variable is $M_{\max}$ - which is observed as 1 if the latent variable is positive, i.e. Mutual Max reciprocation is observed and zero otherwise. $\mathrm{X}_{\max}$ is a vector of exogenous covariates, $\beta_{\max}$ is a vector of parameters, $\varepsilon_{\max}$ is the random error term that is assumed to be normally distributed with zero mean and varaiance $\sigma^{2}_{\max}$. It is assumed that $\sigma^{2}_{\max} = 1$, since $\beta_{\max}$ is identified upto a scalable factor only.

Similarly $M_{\min} = 1((M^{*}_{\min} = \mathrm{X}_{\min}\beta_{\min} + \varepsilon_{\min}) > 0) \quad : \varepsilon_{\min} \approx N(0, \sigma^{2}_{\min}) \qquad ...(7.15)$

Here $M^{*}_{\min}$ is the latent propensity of mutual - min and other descriptions are similar.

7.4.1.2 Identification Strategy and Estimation of the Model

The two types of reciprocations by a household are realistically interrelated; so the correlations of these equations' disturbances may be significant. Hence the estimation of the parameters may be consistent but not efficient if the two equations are estimated independently. Hence the parameters are estimated using the multivariate probit model. Important explanatory variables are family asset, income, education, family size, age, preference for informal loan, trusting behavior, guilty feeling, etc. These

variables are satisfactorily exogenous in this framework. The model is described as following.

$$M^{*}_{\max} = \mathrm{X}_{\max}\beta_{\max} + \varepsilon_{\max} \quad \text{and} \quad M^{*}_{\min} = \mathrm{X}_{\min}\beta_{\min} + \varepsilon_{\min}$$

$$\text{and} \quad \begin{pmatrix} \varepsilon_{\max} \\ \varepsilon_{\min} \end{pmatrix} \approx N\left\{ \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix} \right\} \qquad ...(7.16)$$

The summary statistics of important socio-economic, credit rationing, credit transactions, and social preference variables for India and China are presented in Tables 7.9, 7.10, 7.11, 7.12, 7.13, 7.14, 7.15, and 7.16.

Table 7.9: Summary Statistics of Important Socio-Economic Variables (India)

Variable (India)	Obs	Mean	Std. Dev.	Min	Max
sex (Female=1)	399	0.00	0.05	0.00	1.00
age	399	47.45	11.54	22.00	92.00
Education(1-7)	399	3.54	1.60	1.00	7.00
Education (1-4)	399	2.52	0.82	1.00	4.00
Household size	399	6.58	3.30	1.00	30.00
Years of Farming	399	24.05	11.82	2.50	70.00
Farm Size (acre)	399	2.96	2.39	0.15	20.00
Income source(farm=1)	399	0.78	0.42	0.00	1.00
Household Income (Rs.)	399	45440.85	37579.16	2400.00	300000.0
Percent Farm income	399	57.40	25.86	3.00	100.00
Household Asset Value (Rs.)	399	384313.30	359938.90	16000.00	2700000.0
Per cap income (Rs.)	399	7362.76	5326.65	600.00	50000.00
Per cap asset (Rs.)	399	64736.43	67422.58	1818.18	833333.3
Log income	399	10.51	0.63	7.78	12.61
Log asset	399	12.55	0.79	9.68	14.81
Log per cap income	399	8.72	0.60	6.40	10.82
Log per cap asset	399	10.76	0.80	7.51	13.63
Sickness in family(1=yes)	399	0.39	0.49	0.00	1.00
Income std. dev.	399	22299.04	44330.17	402.66	358209.10
Income coeff. of variation	388	0.39	0.16	0.09	0.95
Absolute risk aversion(*10-4)	399	0.11	0.17	0.00	2.00
Relative risk aversion coeff	399	2.05	1.48	0.00	4.00
Risk prone (1=yes)	399	0.98	0.13	0.00	1.00
Income difference	399	0.00	36194.45	-255900.00	47150.00

Risk prone: The family has suffered crop or cattle loss, major sickness, death in 1 year.

Table 7.10: Summary Statistics of Important Credit Rationing Variables (India)

Variable	Obs	Mean	Std. Dev.	Min	Max
Denied formal loan	399	0.44	0.50	0.00	1.00
Denied because of lack of collateral	399	0.46	0.50	0.00	1.00
Interest rate unaffordable (highrate1)	399	0.35	0.48	0.00	1.00
Likely to borrow more if interest rate is reduced (highrate2)	399	0.97	0.18	0.00	1.00
Credit constrained (Creditconstr1)	399	0.64	0.48	0.00	1.00
Credit constrained (Creditconstr11)	399	0.86	0.34	0.00	1.00
Predicted value of credit constrained (Pcreditconst)	384	0.65	0.27	0.02	1.00

Creditconstr1 : Denied loan + could not borrow desired amount of loan for education, health, consumption, farming and business purposes; from formal sources
Creditconstr11: Denied loan +Never got desired amount of loan + could not borrow desired amount of loan for education, health, consumption, farming and business purposes
Pcreditconst: Predicted value of credit constraint, obtained from regressing Creditconstr1 on a bunch of explanatory variables such as age, education, asset, preferences for formal loans etc.

Table 7.11: Summary Statistics of Important Credit Transaction Variables (India)

Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Whether any Debt Outstanding	399	0.81	0.39	0.00	1.00
Amount of Debt (Rs.)	336	15659.08	21430.80	0.00	200000.0
Formal Loan Percent	325	48.40	44.80	0.00	100.00
Informal Loan Percent	325	36.25	42.44	0.00	100.00
Informal loan Amount (Rs.)	325	4015.19	8477.11	0.00	84000.0
Formal Loan Amount (Rs.)	325	10382.46	18877.72	0.00	200000.0
Propensity of Formal Loan	325	0.59	0.49	0.00	1.00
Propensity of Informal Loan	325	0.52	0.50	0.00	1.00
Log informal loan	170	8.22	1.30	4.32	11.34
Log formal loan	193	9.30	1.09	4.32	12.21
Informal formal loan ratio	325	0.11	0.23	0.00	1.62
Loan for production	389	0.65	0.48	0.00	1.00
Loan for risk management	390	0.23	0.42	0.00	1.00
Default on informal loan	399	0.20	0.40	0.00	1.00
Delay on informal loan	399	0.61	0.49	0.00	1.00
Default on formal loan	399	0.23	0.42	0.00	1.00
Delay on formal loan	399	0.50	0.50	0.00	1.00
Delay or default on formal loan	399	0.63	0.48	0.00	1.00
Delay or default on informal loan	399	0.83	0.37	0.00	1.00
Prefer not to default on informal loan	399	0.80	0.40	0.00	1.00
Prefer informal loan	399	0.51	0.50	0.00	1.00
Informal loans are convenient	399	0.53	0.50	0.00	1.00
Community Pressure Reduces Default	399	0.63	0.48	0.00	1.00

Table 7.12: Summary Statistics of Important Social Preference Variables (India)

Variable	Obs	Mean	Std. Dev.	Min	Max
Risk share using gifts or loans	399	0.73	0.44	0.00	1.00
Trusts that informal loan will be rapid (trust1)	399	0.79	0.40	0.00	1.00
Will lend even does not trust that loan will be repaid(trust2)	399	0.45	0.50	0.00	1.00
Will lend or borrow even they have refused earlier (alt1)	399	0.79	0.41	0.00	1.00
Stronger version (and conditions) of (alt1)	399	0.27	0.45	0.00	1.00
Strong guilty feeling on defaulting informal loan	399	0.30	0.46	0.00	1.00
Strong guilty feeling on defaulting formal loan	399	0.32	0.45	0.00	1.00
Mutual-min Reciprocity	399	0.51	0.50	0.00	1.00
Mutual max Reciprocity	398	0.64	0.48	0.00	1.00
Mutual max and Mutual-min Reciprocity	399	0.44	0.50	0.00	1.00

Table 7.13: Summary Statistics of Important Socio-Economic Variables (China)

Variable (India)	Obs	Mean	Std. Dev.	Min	Max
Sex (Female=1)	741	0.10	0.30	0.00	1.00
Age	738	2.94	0.97	1.00	4.00
Education(1-7)	739	3.36	1.52	1.00	7.00
Education (1-4)	739	1.40	0.77	1.00	4.00
Household size	1540	4.39	1.54	0.00	21.00
Years of Farming	1538	27.35	13.14	0.00	70.00
Farm Size (mu)	1540	5.39	3.29	0.30	25.00
Income source(farm=1)	1540	0.42	0.49	0.00	1.00
Household Income (RMB)	1522	10559.52	8090.53	0.00	50000.00
Percent Farm income	1535	46.80	33.86	0.00	100.00
Household Asset Value (RMB)	1416	51112.29	44605.24	1000.00	500000.00
Per cap income (RMB)	1536	2707.55	2742.77	0.00	40000.00
Per cap asset (RMB)	1413	12625.41	11702.82	250.00	100000.00
Log income	1537	9.01	0.84	5.52	12.21
Log asset	1416	10.48	0.93	6.91	13.12
Log per cap income	1534	7.59	0.80	3.96	10.60
Log per cap asset	1413	9.06	0.93	5.52	11.51
Sickness in family(1=yes)	1540	0.19	0.40	0.00	1.00
Income std. dev.	1540	6625.39	74472.76	0.00	2323063.00
Income coeff. of variation	1469	0.31	0.16	0.00	0.99
Absolute risk aversion(*10-4)	1136	1.51	2.89	0.00	40.00
Relative risk aversion coeff	1136	2.77	1.52	0.00	4.00
Risk prone (1=yes)	741	0.77	0.42	0.00	1.00
Income difference	1522	0.00	7242.38	-38879.07	14847.46

Risk prone: The family has suffered crop or cattle loss, major sickness, death in 1 year.

Table 7.14: Summary Statistics of Important Credit Rationing Variables (China)

Variable	Obs	Mean	Std. Dev.	Min	Max
Denied formal loan	1530	0.27	0.44	0.00	1.00
Denied because of lack of collateral	521	0.65	0.48	0.00	1.00
Interest rate unaffordable (highrate1)	674	0.54	0.50	0.00	1.00
Likely to borrow more if interest rate is reduced (highrate2)	674	0.69	0.46	0.00	1.00
Credit constrained (Creditconstr1)	1540	0.36	0.37	0.00	1.00
Credit constrained (Creditconstr11)	1539	0.57	0.48	0.00	1.00
Predicted value of credit constrained (Pcreditconst)	660	0.57	0.13	0.20	0.83

Creditconstr1 : Denied loan + could not borrow desired amount of loan for education, health, consumption, farming and business purposes; from formal sources
Creditconstr11: Denied loan +Never got desired amount of loan + could not borrow desired amount of loan for education, health, consumption, farming and business purposes
Pcreditconst: Predicted value of credit constraint, obtained from regressing Creditconstr1 on a bunch of explanatory variables such as age, education, asset, preferences for formal loans etc.

Table 7.15: Summary Statistics of Important Credit Variables (China)

Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Whether any Debt Outstanding	1536	0.52	0.50	0.00	1.00
Amount of Debt (RMB)	1015	13165.81	26268.60	0.00	480000.00
Formal Loan Percent	809	34.72	42.00	0.00	100.00
Informal Loan Percent	809	63.92	42.30	0.00	100.00
Informal loan Amount (RMB)	800	8231.40	12475.78	0.00	150000.00
Formal Loan Amount (RMB)	800	7900.17	22005.97	0.00	398400.00
Propensity of Formal Loan	809	0.46	0.50	0.00	1.00
Propensity of Informal Loan	809	0.78	0.42	0.00	1.00
Log informal loan	624	8.68	1.17	4.61	11.92
Log formal loan	371	9.14	1.13	4.61	12.90
Informal formal loan ratio	791	1.46	3.31	0.00	50.00
Loan for production	1354	0.35	0.48	0.00	1.00
Loan for risk management	1354	0.22	0.41	0.00	1.00
Default on informal loan	1499	0.04	0.19	0.00	1.00
Delay on informal loan	1499	0.39	0.49	0.00	1.00
Default on formal loan	1485	0.02	0.15	0.00	1.00
Delay on formal loan	1540	0.14	0.35	0.00	1.00
Delay or default on formal loan	1501	0.39	0.49	0.00	1.00
Delay or default on informal loan	1511	0.45	0.50	0.00	1.00
Prefer not to default on informal loan	739	0.93	0.25	0.00	1.00
Prefer informal loan	674	0.72	0.45	0.00	1.00
Informal loans are convenient	739	0.82	0.38	0.00	1.00
Community Pressure Reduces Default	741	0.77	0.42	0.00	1.00

Table 7.16: Summary Statistics of Important Social Preference Variables (China)

Variable	Obs	Mean	Std. Dev.	Min	Max
Risk share using gifts or loans	741	0.67	0.47	0.00	1.00
Trusts that informal loan will be rapid (trust1)	1535	0.90	0.30	0.00	1.00
Will lend even does not trust that loan will be repaid(trust2)	1538	0.62	0.49	0.00	1.00
Will lend or borrow even they have refused earlier (alt1)	740	0.81	0.39	0.00	1.00
Stronger version (and conditions) of (alt1)	740	0.52	0.50	0.00	1.00
Strong guilty feeling on defaulting informal loan	1540	0.54	0.50	0.00	1.00
Strong guilty feeling on defaulting formal loan	1540	0.44	0.50	0.00	1.00
Mutual-min Reciprocity	741	0.40	0.49	0.00	1.00
Mutual max Reciprocity	741	0.73	0.45	0.00	1.00
Mutual max and Mutual-min Reciprocity	1540	0.15	0.36	0.00	1.00

The estimation results of equation (7.16) are reported in Table 7.17. The estimation models for both the countries are significant, as Wald Chi square statistics are significantly high.

Important inferences from the above estimations are mentioned as following:

1. Household asset or income is not significantly associated with mutual-max or mutual-min in the case of India. But in the case of China income is positively and significantly associated with mutual-max and family asset is significantly and negatively associated with mutual-min reciprocation. Apparently the families with higher income more often reciprocate in mutual-max manner and the families having higher assets less often reciprocate in mutual-min manner. Variation of propensity of all possible combinations of mutual-max and mutual-min preferences with income has been shown in Figure 7.4. Apparently in the case of both the countries probability of showing preferences for both mutual-max and mutual-min increases with income.

2. Demographic variables, sex, age etc. are not significantly related with mutual-max or mutual-min in both countries, except that in the case of China, mutual-min seems to decline with age in the beginning, but beyond a critical age it starts increasing.

Table 7.17: Multivariate Probit Estimation of mutual-max and mutual-min

Variables	mutual-max: India		mutual-min: India		mutual-max: China		mutual-min: China	
	Coeff.	Z stat	Coeff.	Z stat	Coeff.	Z stat	Coeff.	Z stat
Sex (Female=1)					-0.19	0.74	0.14	0.56
Age	-0.03	-0.63	0.08	1.6	-0.49	0.98	-0.92*	2.06
Age sq	0.00	0.59	0.00	-1.4	0.08	0.86	0.19*	2.32
Family size	0.00	-0.06	0.03	0.8	-0.10	1.66	0.08	1.39
Education	-0.19	-1.55	0.05	0.4	0.05	0.49	-0.16	1.58
Farm income	0.00	0.39	0.00	0.1	0.00	1.48	0.00	0.72
Log asset	-0.15	-0.81	-0.13	-0.7	-0.04	0.27	-0.25*	2.05
Log income	-0.27	-1.29	-0.29	-1.5	0.30*	2.4	0.00	0.03
Prefer friend	0.06	0.25	0.10	0.4	-0.30	1.63	-0.08	0.47
Abs risk aversion	-0.21	-0.33	-0.27	-0.4	0.05	0.82	-0.11	1.56
Denied collateral	-0.57*	-2.47	-0.26	-1.2	0.23	1.15	0.18	1.04
Saving	0.10	0.73	-0.10	-0.8	0.01	0.15	0.03	0.4
Precaution	-0.55*	-2.22	0.07	0.3	-0.17	1.09	0.27*	1.81
Sickness	0.34	1.59	0.67*	3.2	0.09	0.47	-0.06	0.36
Food	0.51*	2.4	0.47*	2.29	-0.04	0.21	0.58*	3.28
guilty	-0.24	-0.9	-0.13	-0.5	-0.04	0.24	-0.20	1.28
Altruism	0.30	1.34	-0.12	-0.6	0.42*	2.59	-0.31*	2.07
Risk share	-0.21	-1.12	-0.29	-1.6	0.67*	4.09	-0.12	0.79
Trust	0.01	0.04	0.07	0.3	-0.08	0.33	0.57*	2.46
Trust2	0.92*	4.06	0.19	0.9	0.37*	2.28	-0.04	0.25
Prefer not default	1.02*	3.81	0.59*	2.2	0.56	1.59	0.07	0.2
region6	1.52*	3.13	-0.21	-0.5	0.31*	1.8	0.40*	2.45
region8	0.28	0.75	-1.53	-4				
region9	0.98*	2.42	0.38	1.0				
_cons	5.38	1.83	-0.61	-0.2	-2.76	1.41	2.60	1.44
/atrho21	0.48	3.89			.26	2.8		
rho21	0.45	4.52			.25	2.93		

India: N = 324; Wald chi2(50) = 174.17; Prob > chi2 = 0.00
China : N = 367; Wald chi2(48) = 102.88; Prob > chi2 = 0.00

3. Education is not significantly related with the mutual-max or mutual-min reciprocation in the case of both countries. However in the case of India it is negatively associated with mutual-max whereas in the case of China it is negatively associated with mutual-min.

4. Preference of loans from friends and relatives is not significantly associated with mutual-max and mutual-min in the case of both the countries.

5. Household savings is not significantly associated with either mutual-max or mutual-min in the case of both the countries. However, the families having more precautionary savings apparently less often behave as mutual-max in the case of India and more often behave as mutual-min in the case of China.

6. Major sickness in family is positively associated with mutual-min in the case of India, but no significant association is observed in the case of China. Also the families having food shortage problems seem to behave more often as mutual-min in the case of China and both mutual-max and mutual-min in the case of India.

7. Propensity for mutual-max is higher for the families who have altruistic attitude and also propensity for mutual-min is lower for those families. The results are significant in the case of China. Apparently the people having altruistic preference are more likely to behave as mutual-max and less likely to behave as mutual-min.

8. In the case of China risk sharing is positively associated with mutual-max and negatively associated with mutual-min. This way it lends credence to the assertion that both risk sharing motive and fairness reciprocations are needed to explain the informal lending.

9. Trusting preferences does not seem to be significantly associated with mutual-max. However in the case of China the people having trusting preferences are more likely to behave as mutual-min.

10. The correlation coefficient (ρ) is positive and significant for both the countries– which validates our hypothesis that the two decisions are significantly correlated.

Overall it is inferred that social preferences for mutual-max and mutual-min can be explained by several demographic, socio-economic and other behavioral variables. Moreover both these preferences are positively correlated, implying that for a large number of people both these types of reciprocations go together, that may depend on the circumstances of interactions. However, in the aggregate preferences for mutual-max dominate. And such type of fairness motives may be helpful in explaining informal lending and borrowing, which will be empirically investigated next.

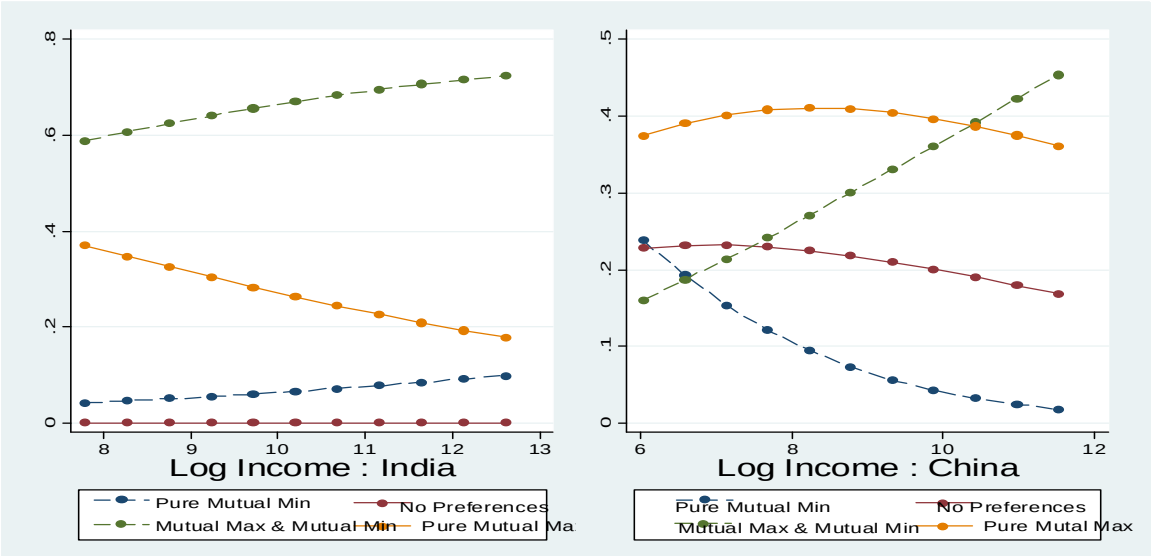

Figure7.4: Variation of Various Combinations of mutual-max and mutual-min with Income

7.4.2. Empirics of Fairness Reciprocations and Informal Lending

The main objective of the proposed analysis is to understand the nature of association of mutual-max and mutual-min reciprocations with informal lending and borrowing. One complexity arises here; preferences for mutual-max and mutual-min are not found to be mutually exclusive, as reported in Table 7.7. A good number of observations are found to be in each cell of 2 ×2 Table, where rows are described by mutual-max (1

and 0) and columns are described by mutual-min (1 and 0). In this scenario it is arguable to set the reference cell from which comparisons can be made of the outcomes of the other cells.

For example if we want to analyze - how the mutual-max is associated with informal lending and borrowing, then we have two options. One to just choose cell (1,0) i.e. mutual-max=1, and mutual-min=0 (which can be said as pure mutual-max behavior) then about 40 percent respondents in China and 20 percent respondents in India fall in this category and analyze the relevant query. But here we are losing the information of cell (1, 1) i.e. mutual-max=1, and mutual-min=1. Hence another related option is to choose both cells (1,0) and (1,1) and analyze the query. Such analysis related to percentage of informal loans and actual amount is reported in Table 7.18 and Table 7.19.

Table 7.18: Fairness Reciprocity and Informal Loan Percentage

mutual-max	mutual-min(China)			mutual-min(India)		
	0	1	Total	0	1	Total
0	42.62	**53.76**	45.56 (110)	35.76	**25.36**	33.70 (126)
1	**42.15**	39.8	41.17 (287)	**33.01**	40.5	37.86 (199)
Total	42.3(249)	42.5(148)	42.4 (397)	34.6	38.03	36.25 (324)

Average Informal Debt Percentage : India: 36.25; China: 63.92.

Table 7.19: Fairness Reciprocity and Informal Loan Amount

mutual-max	mutual-min (China)			mutual-min (India)		
	0	1	Total	0	1	Total
0	5138.8	**7405.2**	5741.8 (110)	2519.5	**7398**	3487.5 (126)
1	**7196.2**	5817.5	6628.6 (287)	**4039.8**	4517.3	4349.4 (199)
Total	6530(249)	6132 (148)	6382.5 (397)	3141.8 (171)	4984.5 (154)	4015.8 (324)

Average Informal Loan Amount: India: 4015.18, China: 8231.00

Clearly in the case of India informal loan percentage and amount are higher for mutual-max in second option, but in first option only informal loan percentage is

higher. In the case of China both percentages and amount are lower for mutual-max in both options. These findings essentially clarify the above stated complexity.

The problem is that we are making inappropriate comparisons here. The proper way to get right identification on differences is that outcomes observed for mutual-max reciprocation for a person need to be compared to the outcomes if that person does not behave in mutual-max manner. This is a counterfactual query that can not be observed. However with recent advances in econometrics – namely propensity score methods [46] this complexity can be overcome. The same is described next.

7.4.2.1 Comparisons Using Propensity Score Method

Let Y_{1i} be potential informal borrowing outcome for an individual i if the reciprocation is mutual-max and Y_{0i} be potential outcome when the reciprocation is mutual-min.

$$\text{Informal Borrowing Outcome} = \begin{cases} Y_{1i} & \text{if mutual-max, } M_i = 1 \\ Y_{0i} & \text{if mutual-max, } M_i = 0 \end{cases} \qquad ...(7.17)$$

$$\text{The desired measure of difference in outcome is} = Y_{1i} - Y_{0i}$$

But the fundamental problem of causal inference is that we can only observe one of the above outcomes for a specific individual. The best we can do is to measure the average of Y_{1i}- Y_{0i} for a group of people who show mutual-max reciprocations. i.e. $E[Y_{1i}- Y_{0i} \mid M_i=1]$. Now the observed differences in informal borrowing outcome is,

$$E[Y_i \mid M_i = 1]-E[Y_i \mid M_i = 0] = E[Y_{1i}- Y_{0i} \mid M_i=1] + \{E[Y_{0i} \mid M_i=1] - E[Y_{0i} \mid M_i=0]\} \qquad \ldots(7.18)$$

Where the first term on the right hand side (R.H.S.) of equation (7.18) is called as Average treatment effect on the treated (TOT) and second term is known as selection bias. If selection bias turns out to be positive (assuming potential outcome is higher for mutual-max reciprocation), then the observed difference will be exaggerated. Also

[46] Rosenbaum and Rubin (1983), Dehejia and Wahba (1999) , Angrist and Pishke(2009)

another measure of the desired difference is known as average treatment effect – i.e. comparing the potential outcome if everyone demonstrates mutual-max behavior to the potential outcome if every one does not show mutual-max behavior – this is called as Average treatment effect (ATE). This is described as following:

$ATE = E[Y_{1i}-Y_{0i}] = E[Y_1] - E[Y_0]$ …(7.19)

Where, $E[Y_1]$ = Average outcome if everyone shows mutual-max behavior and

$E[Y_0]$ = Average outcome if everyone does not show mutual-max behavior

Now, $E[Y_i|M=1]-E[Y_i|M=0] = ATE + \{E[Y_{0i} \mid M_i=1] - E[Y_{0i} \mid M_i=0]\}$ ...(7.20)

Again as discussed before the second term of R.H.S. of equation (7.20) is selection bias. This selection bias becomes ignorable under the assumption of random assignment i.e. potential outcomes are independent of treatment assignment conditional on a set of control variables X, i.e. no self selection takes place. The identifying assumption rests on conditional independence axiom (CIA), also known as selection on observables. It guarantees that conditional on observed characteristics X_i , selection bias disappears, i.e.

$$\{Y_{1i}, Y_{0i}\} \perp M_i \mid X_i; \perp \text{ shows independence relation;} \quad ...(7.21)$$

Then using propensity score theorem (Angrist and Pischke, 2009 pp. 80-81) – which states that potential outcomes are independent of treatment status conditional on a scalar function of covariates , propensity score defined as $p(X_i) = P(M_i= 1|X_i)$, where P(.) indicates probability function. This theorem implies that,

$$\{Y_{1i}, Y_{0i}\} \perp M_i \mid X_i \quad \Rightarrow \{Y_{1i}, Y_{0i}\} \perp M_i \mid p(X_i) \text{ ; where } p(X_i) = \text{propensity score} \quad ...(7.22)$$

Now the measurement formula for ATE is developed as following: (7.17):

Using equation (7.17): $ATE = E[Y_{1i}-Y_{0i}] = E[Y_1] - E[Y_0]$

Where each of the expectations needs to be taken over all the observations. But actually we observe, E $[Y_{1i}|M_i=1, X_i]$ and E $[Y_{0i}|M_i=0, X_i]$. Then using Baye's theorem of probability, we can get following expressions:

$E[Y_{1i}]_{all} = E[Y_{1i}|M_i=1, X_i]P(M_i=1)/ p(X_i)$; and

$E[Y_{0i}]_{all} = E[Y_{0i}|M_i=0, X_i](1-P(M_i=1))/ (1-p(X_i))$; hence

$$ATE = E[Y_{1i}|M_i=1, X_i]P(M_i=1)/ p(X_i) - E [Y_{0i}|M_i=0, X_i] (1-P (M_i=1))/ (1-p (X_i)) \quad \ldots(7.23)$$

Similarly average treatment effect on treated (TOT) is described by following equation:

$$TOT = E[Y_{1i}- Y_{0i} | M_i=1] = E[Y_{1i}| M_i=1]- E[Y_{0i} | M_i=1] \quad \ldots(7.24)$$

The first term on the R.H.S. of equation (7.24) is observed in data. The expression for second term is obtained using Baye's theorem of probability;

$$E[Y_{0i} | M_i=1] = E[Y_{0i} | M_i=0] p(X_i).(1-P(M_i=1))/ ((1- p(X_i)).P(M_i=1)) \quad ...(7.25)$$

$$TOT = E[Y_{1i}| M_i=1]- E[Y_{0i} | M_i=0] p(X_i).(1-P(M_i=1))/ ((1- p(X_i)).P(M_i=1)) \quad \ldots(7.26)$$

Now we can obtain desired outcome differences for mutual-max (mutual-min) reciprocity either using equation (7.23) or equation (7.26) depending upon whether we are interested in knowing average treatment effect on all (ATE) or average treatment effect on treated (TOT)i.e. persons showing mutual-max behavior.

7.4.2.1.1. Estimation and Results

Three outcomes related with informal lending used here are - percentage of informal loan (of total loan), informal loan amount, and proportion of the families taking informal loan. The results are reported in Table 7.20 and Table 7.21.

Table 7.20: mutual-max Reciprocity, Propensity Score and Informal Loan

	Informal Loan, percent: India	Informal Loan, percent :China	Informal Loan Amount: India	Informal Loan Amount: China	Informal Loan (1=yes) : India	Informal Loan: (1=yes) China
Mutual-max=1, weighted: (ATE)	38.74 (198)	42.46 (249)	4097.12	6680.45	0.55 (198)	0.67 (249)
Mutual-max=0, weighted (ATE)	28.50 (126)	45.49 (105)	2932.87	5482.83	0.44 (126)	0.66 (105)
Difference (ATE)	10.24* s.e.4.63	-2.97 s.e. 4.86	1164.25 s.e. 814.02	1197.62 s.e. 974.80	0.11* s.e. .056	0.01 s.e. .055
Mutual-max=1	37.86 (199)	41.17 (287)	4349.32	6628.62	0.54 (199)	0.64 (287)
Mutual-max=0, weighted: (TOT)	25.04 (126)	44.67 (105)	2565.10	5318.42	0.40 (126)	0.66 (105)
Difference (TOT)	12.82* s.e. 4.5	-3.50 s.e. 4.78	1784.22* s.e. 736.48	1310.20 s.e. 942.44	0.14* s.e. .056	-0.02 s.e..054

Note: s.e. means standard error; The numbers in brackets (.) show the number of observations.
ATE: Average Treatment Effect; TOT: Treatment Effect on Treated

Table 7.21: mutual-min Reciprocity, Propensity Score and Informal Loan

	Informal Loan, percent: India	Informal Loan, percent :China	Informal Loan Amount: India	Informal Loan Amount: China	Informal Loan (1=yes) : India	Informal Loan: (1=yes) China
Mutual min=1, weighted: ATE	40.40 (153)	40.24 (132)	4953.62	7326.63	.56 (153)	.65 (132)
Mutual min=0, weighted: ATE	29.54 (171)	43.40 (222)	2870.42	6418.43	.42 (171)	.66 (222)
Difference (ATE)	10.86* s.e. 4.85	-2.84 s.e. 4.34	1083.20 s.e. 1101.30	904.20 s.e. 1355.32	.14* s.e. .055	-.01 s.e. .052
Mutual min=1	38.04 (154)	42.52 (148)	4984.90	6132.84	.54 (154)	.65 (148)
Mutual min=0, weighted :TOT	23.87 (171)	41.46 (222)	2565.10	5830.48	.34 (171)	.65 (222)
Difference (TOT)	15.17* s.e. 4.58	1.06 s.e. 4.27	2419.80* s.e. 736.25	202.36 s.e. 976.02	.20* s.e. .054	0.00

As guided by Result 7.2, it is hypothesized that these outcomes related to informal loan should be higher for the families who show preferences for, mutual-max reciprocity, compared to those who do not show such preferences. Important inferences are mentioned as following:

1. In the case of India, the percentages of informal loan are significantly higher (using ATE and TOT measure) for the families showing preferences for mutual-max reciprocity in comparison to the families who do not show preferences for such reciprocity. In the case of China no such significant results are obtained.
2. In the case of India, informal loan amount is significantly higher (using TOT measure) for families showing preferences for mutual-max reciprocity in comparison to the families who do not show such preferences. In the case of China no such significant results are obtained. In the case of China the informal loan amount is higher for the families showing preferences for mutual-max, but the results are not significant.
3. In the case of India, Significantly higher proportion of families (using ATE and TOT measure) showing preference for mutual-max reciprocity take informal loan. In the case of China the results are not significant.
4. However, in the case of India it is observed that these outcomes are also significantly higher for the families showing preferences for mutual-min reciprocity in comparison to the families who do not show such preferences. This is against the conjecture. In the case of China, the results are similar but not significant. One reason may be that mutual-min and mutual-max categorization is not mutually exclusive. As observed in the data large percentages of families show preferences for both the reciprocities. The propensity score method is used to make such assignments random conditional on observables, but apparently this method has its own limitations.

Another reason may be that, informal lending and borrowing are driven by several motives and fairness motive is one among these including the risk sharing motive.

Further these outcomes are presented graphically in Figures 7.5 and 7.6. In Figure 7.5 the density function of informal loan percentage is plotted against preferences for mutual-max reciprocity for both the countries. Evidently the density functions for mutual-max=1 seem to dominate the density functions for mutual-max = 0, for informal loan percentage beyond 40 – which gives credence to our hypothesis. In Figure 7.6 the density function of informal loan percentage is plotted against preferences for mutual-min reciprocity for both the countries. Apparently in the case of India the density function for mutual-min=1 seems to dominate the density function for mutual-min= 0, for informal loan percentage less than 60, but beyond that the density function for mutual-min =0 seems to dominate; which is as per the conjecture. In the case of China the density function for mutual-min =1 seems to dominate the density function for mutual-min = 0, for informal loan percentage greater than 40; which seems to be counterintuitive, but does not disprove our hypothesis in any way.

In figure 7.7 the density function of informal loan percentage is plotted against the preferences for pure mutual-min (mutual-min=1, mutual-max=0) reciprocity for both the countries. Apparently in the case of India the density functions for mutual-min=1 seems to dominate the density functions for mutual-min= 0; which is against the conjecture. However, in the case of China the density functions for mutual-min=0 seems to dominate the density function for mutual-min= 1; which is as per the conjecture.

Overall the results support the hypothesis that informal loan outcomes should be higher for the families who show preferences for mutual-max reciprocity – more strongly in the case of India. However no neat inferences are obtained related to the preferences for mutual-min reciprocity. The results obtained here present a mixed

picture. At the least it can be said that families who show preferences for mutual-max fairness reciprocities attach high significance to informal financial transaction among friends and relatives.

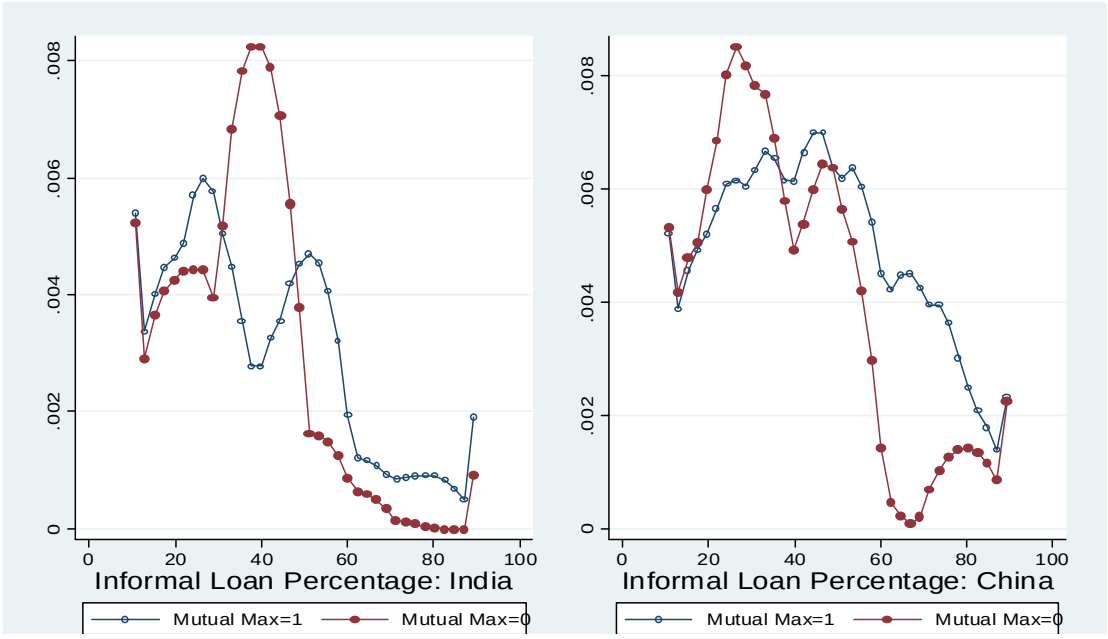

Figure7.5: Informal Loan Percentage and mutual-max Reciprocation: Density Function

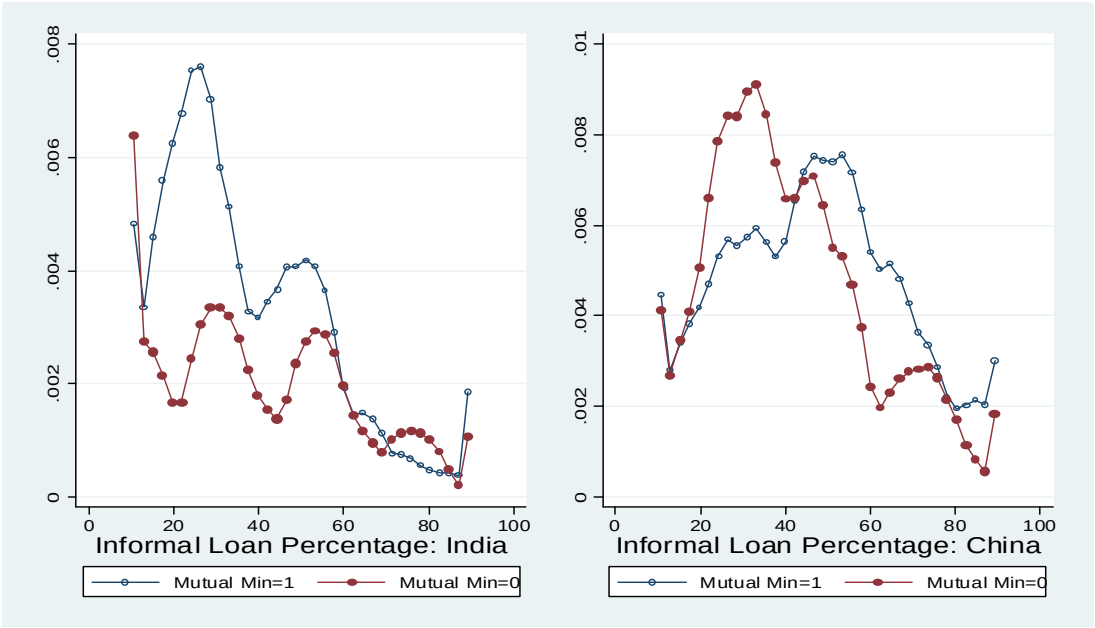

Figure7.6: Informal Loan Percentage and mutual-min Reciprocation: Density Function

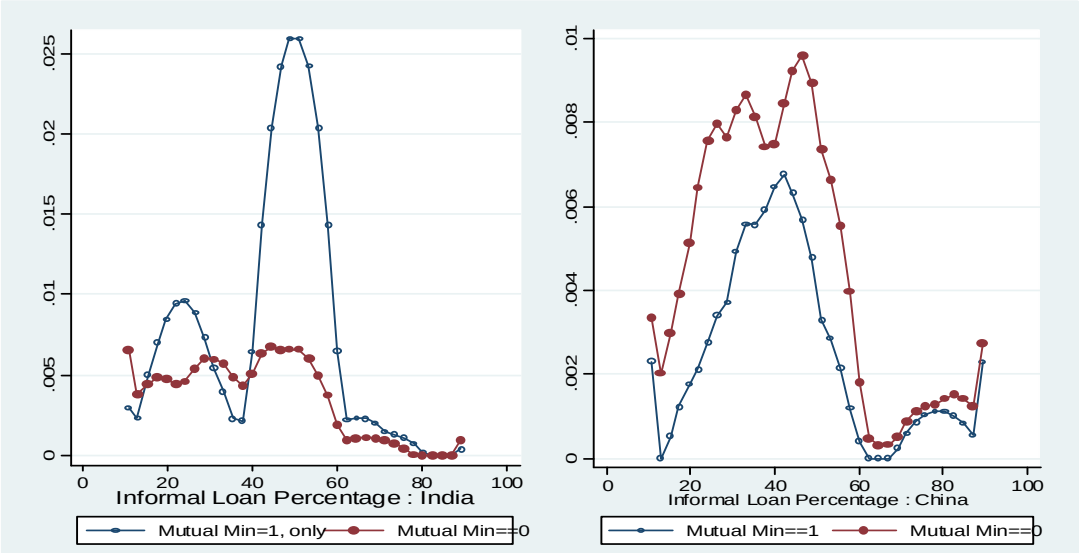

Figure7.7: Informal Loan Percentage and mutual-min (pure) Reciprocation: Density Function

7.4.2.2. Inferences using Structural Regression Equations

Theoretically there is nothing interesting in mutual-min fairness equilibrium; no lending takes place. The lending and repayment in mutual-max fairness equilibrium is described by the equation (7.11), which is reproduced here. Using this equation, approximate linear estimation model is proposed in equation (7.27). Further as seen earlier the preferences for mutual-max and mutual-min are also described by equations (7.28) and (7.29).

$$x^* = \frac{(\beta+\gamma)y_0^2 - (\beta\gamma+1)(y_1^2)}{(\beta+\gamma)+(\beta\gamma+1)} \;;\; \gamma = \frac{1}{2\ln(1/2 + y_0^2/2y_0^1)}; \qquad \ldots(7.11)$$

Here $y_1^2 = y_0^1$, i.e. income of lender in period 1 = income of borrower in period 0.

$\Rightarrow \log x^* = \log((\beta+\gamma)y_0^2 - (\beta\gamma+1)(y_0^1)) - \log((\beta+\gamma)-(\beta\gamma+1))$

This is a highly non linear equation in terms of the incomes of participants, which may not be estimated easily. However an approximate linear variant of this, as proposed below, can be used to learn the importance of fairness motives.

$$\log(\text{informal loan}) = \alpha + \beta.\log(\text{income difference}) + \gamma 1.\text{mutual - max} + \gamma 2.\text{mutual - min}$$
$$+ \gamma 3\text{mutual - max} * \text{mutual - min} + \lambda(\text{Risk Share}) + \theta.\text{default} + \mu X + \varepsilon \quad ...(7.27)$$

Here income difference should be ideally computed as = income of lending partner - self income.

But in absence of such detailed data it is approximately estimated as ,

Income difference = Mean Village Income - Self Income.

X is a set of control variables such as; age, education, asset, income, family size, risk aversion, loan used for production and risk management purpose, and credit constrainedness. In this regression motivations for risk share is also controlled for.

$$\text{mutual - max} = \beta_{\max} X_{\max} + \varepsilon_{\max} \quad ...(7.28) \quad \text{and}$$

$$\text{mutual - min} = \beta_{\min} X_{\min} + \varepsilon_{\min} \quad ...(7.29)$$

Here interaction term is used in equation (7.27) to saturate the model, as a good number of respondents have shown preferences for both types of reciprocity.

7.4.2.2.1. Estimation and Identification Strategy

Equations (7.27), (7.28) and (7.29) form a system of equations. We are primarily interested in the coefficients β, γ1, γ2, and γ3. For consistent estimation of these coefficients, it is necessary that the explanatory variables are not correlated with the error term. For this the variables should be satisfactorily exogenous. However this requirement seems to be violated for the fairness (mutual-max and mutual-min) variables, as these are themselves explained by several variables which are common to the variables belonging to equation (7.27). To overcome this problem, the most efficient method is to use full information maximum likelihood method (FIML) – that estimates these three equations simultaneously using maximum likelihood method. However this one seems to be complicated and also here convergence of solutions are not guaranteed. Hence we propose a simpler method to estimate the coefficients as following: (i) in the first stage the equations (7.28) and (7.29) are estimated using

linear probability model (basically OLS), and (ii) in the second stage the equation (7.27) is estimated (using OLS), wherein the predicted values of mutual-max and mutual-min (from the first stage) are used. It is ensured that in the first stage exclusion restriction is satisfied.

In this estimation scheme it is hypothesized that, higher amount of informal loan is associated with, (a) larger values of income differences $\beta > 0$, (b) higher values of mutual-max $\gamma 1 > 0$, and (c) lower values of mutual-min $\gamma 2 < 0$. There is no a priori conjecture on the coefficient of interaction of mutual-max and mutual-min $\gamma 3$. The positive coefficient implies that the families who show preferences for both mutual-max and mutual-min get higher outcome related to informal borrowing.

7.4.2.2.2 Results and Inferences on Informal Loan Percentages

First the above system of equations is estimated for informal loan percentage (of total loan) as dependent variable in the equation (7.27). The first stage estimations have been found to be satisfactorily significant: F statistics are around 5.5 and adjusted R square is about .20 for both mutual-max and mutual-min OLS regressions, for both the countries. In these regressions the additional explanatory variables (for exclusions restrictions) used are – other social preferences such as trust, guilty feeling, altruistic preferences, prefer not to default on loans, and preferences for loans from friends and relatives. It is realistically conjectured that these variables affect informal loan (percentage and amount) through the mutual-max and mutual-min reciprocities.

The first stage estimation results are not reported here, as we are primarily interested in the sign and significance of coefficients β, $\gamma 1$, $\gamma 2$, and $\gamma 3$ of the second stage results. From the first stage the predicted values of mutual-max and mutual-min are obtained and used in the second stage. The second stage result is reported in Table (7.22). In columns 1 and 2 (related to India and China) all the fairness variables, mutual-max,

mutual-min and interaction term are simultaneously used as explanatory variables, whereas in columns 3 and 4 only mutual-max variable is used. The second stage is estimated using OLS. All the four regressions are statistically significant – as F statistic and adjusted R square are satisfactorily high.

Table 7.22: Informal Loan Percentage and mutual-max and mutual-min Reciprocities

Dependent variable:	**India (1)**		**China (2)**		**India (3)**		**China (4)**	
Informal Loan Percentage	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
Age	1.53	1.18	29.9*	2.04	1.36	1.06	27.43*	1.88
Age sq	-0.02	-1.40	-5.18*	-1.94	-0.02	-1.32	-5.03*	-1.88
Household size	-1.35	-1.59	-0.48	-0.29	-1.32	-1.57	-0.153	-0.09
Education	-2.95	-0.83	-2.05	-0.58	-3.96	-1.18	-0.36	-0.11
Log asset	1.00	0.20	-11.74*	-3.24	1.42	0.29	-9.21*	-2.7
Log income	3.50	0.45	15.51*	2.46	4.31	0.56	12.89*	2.08
Risk share	3.31	0.71	1.51	0.29	3.76	0.81	0.03	0.01
Abs risk coeff.	-18.65	-1.07	-3.86*	-2.22	-17.72	-1.02	-3.7*	-2.12
Credit constraint	-7.22	-0.44	151.44*	6.8	-9.78	-0.6	152.5*	6.87
Loan risk management	8.76	0.95	4.05	0.51	9.87	1.08	4.92	0.62
Loan production	-20.1*	-2.27	-14.43*	-1.87	-17.7*	-2.08	-14.5*	-1.88
Income difference(exp-4)	0.1*	1.99	0.05	1.16	0.09*	2.05	0.05	1.11
mutual-max	7.47	0.31	29.81	0.53	-13.35	-1.14	7.46	0.39
mutual-min	-20.74	-0.64	24.05	0.26				
(max*min)	-9.98	-0.33	-129.31	-1.08				
Default Informal	0.90	0.04	-30.44	-0.8	13.61	0.62	-36.56	-0.96
Region6	2.46	0.20			6.27	0.57		
Region8	-27.16*	-2.32			-20.93*	-2.3		
Region9	5.03	0.42	-17.12	-1.34	-2.48	-0.26	-37.5*	-5.96
_cons	4.20	0.04	-54.98	-0.59	-6.45	-0.06	-56.98	-0.74

India (1): N= 314; F (19, 293) =5.23; Prob > F= 0.00; Adj R-squared = 0.20
China (2): N= 346; F (18, 333) = 3.06; Prob > F = 0.00 Adj R-squared = 0.10
India (3): N = 314; F (17, 295) = 5.81; Prob > F = 0.00; Adj R-squared = 0.21
China (4): N= 346; F (18, 333) = 3.08; Prob > F = 0.00 Adj R-squared = 0.09

Important inferences for the estimations of column 1 and 2 are mentioned as following:

1. In the case of both the countries, mutual-max is not found to be significantly associated with informal loan percentage, however the sign is appropriate. Thus evidence in support of hypothesis (b) is not obtained.

2. Similarly In the case of both the countries, mutual-min is not found to be negatively (significantly) associated with informal loan percentage. Hence evidence in support of hypothesis (c) is also not obtained.

3. In the case of both the countries, the interaction term of mutual-max and mutual-min is not found to be significant. Its coefficient bears negative sign in the case of both the countries.

4. In the case of both the countries, income difference is found to be positively associated (significant in the case of India) with informal loan percentage. This result is in conformity with hypothesis (a).

5. In the case of both the countries, default on informal loan is not found to be significant. However the coefficient bears appropriate (negative) sign in the case of China.

6. Absolute risk aversion is found to be negatively associated with informal loan percentage. Apparently more risk averse families prefer to take less loans. Also these loans seem to be used more for risk management purpose and less for production purpose. Also more credit constrained families seem to depend more on informal loans.

Furthermore, for the estimations of column 3 and 4, where only mutual-max reciprocity is used, similar inferences are obtained. Again mutual-max is not found to be significantly associated with informal loan percentage. Moreover in the case of India, its coefficient bears negative sign – which is not in conformity with the hypothesis (b).

The estimation results for only mutual-min reciprocity are reported in Table 7.23. In columns 1 and 3 (related to India and China) income difference is used as an explanatory variable, whereas in columns 2 and 4 (for India and China) log of income difference is used. Here mutual-min is found to be negatively and nearly significantly

(in the case of China) associated with informal loan percentage. This provides supporting evidence for hypothesis (c).

Thus for informal loan percentage, mixed results are obtained. The preferences for mutual-max and mutual-min are not found to be significantly associated with it, when all the fairness variables are used simultaneously. However, when mutual-max and mutual-min are separately used in the estimation; mutual-max is again not found to be significantly associated with informal loan percentage, but mutual-min is found to be negatively associated with that. Hence evidences in support of hypotheses (b) are not obtained, whereas satisfactory evidences are obtained supporting hypothesis (c).

Table 7.23: Informal Loan Percentage and mutual-min Reciprocity

Dependent variable: Informal Loan Percentage	**India (1)**		**India (2) log y diff**		**China (3)**		**China (4) log y diff**	
	Coeff.	t	Coeff.	T	Coeff.	t	Coeff.	T
Age	1.52	1.18	1.46	1.13	28.64*	1.97	27.6*	1.89
Age sq	-0.02	-1.4	-0.02	-1.33	-5.05*	-1.9	-4.8*	-1.82
Household size	-1.36	-1.62	-1.45	-1.72	-0.42	-0.25	-0.65	-0.39
Education	-3.08	-0.93	-3.21	-0.96	-1.62	-0.46	-1.8*	-0.52
Log asset	1.09	0.22	0.12	0.02	-10.4*	-3.05	-10.3*	-3.02
Log income	3.64	0.47	-5.23	-0.9	13.4*	2.19	8.60	1.81
Risk share	3.26	0.7	2.66	0.57	-0.95	-0.21	-0.34	-0.08
Abs risk coeff.	-18.30	-1.05	-23.08	-1.34	-3.65	-2.11	-3.8*	-2.21
Credit constraint	-7.40	-0.45	-7.55	-0.46	151.4*	6.87	150.8*	6.84
Loan risk management	9.14	1.01	7.85	0.87	4.72	0.6	4.79	0.61
Loan production	-19.6*	-2.3	-20.58*	-2.4	-14.8*	-1.92	-14.6*	-1.89
Income difference(exp-4)	0.20*	2	8.89	0.94	0.05	1.02	0.46	0.05
mutual-min	**-22.51**	**-1.49**	**-23.09**	**-1.52**	**-45.96**	**-1.65**	**-48.23**	**-1.73**
Default Informal	3.61	0.16	6.08	0.27	-33.29	-0.88	-31.86	-0.84
Region6	2.98	0.3	5.51	0.57				
Region8	-26.8*	-2.62	-26.45*	-2.56				
Region9	3.57	0.33	4.62	0.43	-25.1*	-2.73	-25.79	-2.8
_cons	3.52	0.03	0.51	0	-30.26	-0.39	11.50	0.08

India (1) N= 324; F (18, 305) = 4.61; Prob > F = 0.00; Adj R-squared = 0.17
India (2) N= 324; F (18, 305) = 4.40; Prob > F = 0.00; Adj R-squared = 0.16
China (3) N= 347; F (16, 330) = 5.60; Prob > F = 0.00; Adj R-squared = 0.18
China (4) N= 347; F (16, 330) = 5.61; Prob > F = 0.00; Adj R-squared = 0.18

7.4.2.2.3. Inference on Informal Loan Amounts

Now the above system of equations is estimated for informal loan amount as dependent variable in the equation (7.27). The first stage estimations are same as discussed previously. The second stage result is reported in Table 7.24. In columns 1 and 3 (related to India and China) income difference is used as an explanatory variable, whereas in columns 2 and 4 (for India and China) log of income difference is used. Further in all the columns all the fairness variables, mutual-max, mutual-min and interaction term are together used as explanatory variables. The second stage is estimated using OLS. All the four regressions are statistically significant, as F statistic and adjusted R square are satisfactorily high.

Table 7.24: Informal Loan Amount and mutual-max and mutual-min Reciprocities

Dependent variable: Log Informal Loan amount	**India (1)**		**India (log y diff) (2)**		**China (3)**		**China (log y diff) (4)**	
	Coef.	T	Coef.	T	Coef.	t	Coef.	T
Age	0.09	1.41	0.09	1.4	0.25	0.31	0.20	0.24
Age sq	0.00	-1.52	0.00	-1.48	0.00	0	0.01	0.07
Household size	0.00	0.01	0.00	-0.07	-0.06	-0.72	-0.08	-0.85
Education	0.05	0.26	0.05	0.27	-0.17	-0.86	-0.18	-0.92
Log asset	0.40	1.56	0.37	1.42	0.12	0.59	0.14	0.67
Log income	0.75*	1.89	0.29	0.95	0.73*	2.12	0.39	1.47
Risk share	0.46*	1.9	0.42	1.71	0.04	0.16	0.06	0.22
Abs risk coeff.	-1.28	-1.42	-1.51	-1.69	-0.24*	-2.56	-0.2*	-2.65
Credit constraint	0.05	0.06	0.12	0.14	5.17*	4.25	5.1*	4.21
Loan risk manage	-0.61	-1.29	-0.68	-1.43	-0.80	-1.86	-0.8	-1.84
Loan production	-1.65*	-3.59	-1.70*	-3.71	-1.13*	-2.69	-1.1*	-2.63
Income difference(exp-5)	0.10*	2.37	0.84*	1.71	0.05*	1.91	0.59	1.13
mutual-max	1.21	0.97	1.24	0.99	1.61	0.53	1.43	0.46
mutual min	1.75	1.05	1.57	0.94	-0.59	-0.12	-1.13	-0.22
(max*min)	-1.19	-0.77	-1.09	-0.7	-5.40	-0.82	-4.68	-0.71
Default informal	0.85	0.65	0.94	0.71	2.76	1.33	2.89	1.39
Region6	0.48	0.77	0.61	0.97				
Region8	1.43*	2.37	1.42*	2.33				
Region9	0.55	0.9	0.65	1.05	0.11	0.15	0.00	0
_cons	-9.59	-1.65	-14.72	-1.58	-2.96	-0.58	-5.98	-0.71

India (1): N = 312; F (21, 290) = 5.98; Prob > F = 0.00; Adj R-squared = 0.25
India (2): N = 312; F (21, 290) = 5.92; Prob > F = 0.00; Adj R-squared = 0.25
China (3): N = 342; F (19, 322) = 5.23; Prob > F = 0.00; Adj R-squared = 0.19
China (4): N = 342; F (19, 322) = 5.10; Prob > F = 0.00; Adj R-squared = 0.19

Important inferences from the above estimations are mentioned as following:

1. In the case of both the countries, mutual-max is found to be positively associated (in all the columns) with informal loan amount but these are not significant– so significant support of hypothesis (b) is not obtained again.

2. In the case of India, mutual-min is found to be positively (not significant) associated with informal loan amount, whereas, in the case of China, it is found to be negatively (not significant) associated. So no significant evidence is obtained on hypothesis (c).

3. Similarly no significant results are obtained for the interaction term of mutual-max and mutual min.

4. In the case of both the countries, for the estimations related to columns 1 and 3, income difference is found to be positively associated with informal loan amount. This result is in conformity with hypothesis (a). However when log of income difference is used as an explanatory variable, it loses its significance in the case of China as shown in column 4.

5. In the case of both the countries, default on informal loan is not found to be significant. However the coefficient bears appropriate (negative) sign in the case of China.

6. Further, absolute risk aversion is found to be negatively associated with informal loan percentage. Apparently more risk averse families prefer to take less loans. Also these loans seem to be used more for risk management purpose and less for production purpose. Also more credit constrained families seem to depend more on informal loans. Further risk sharing motivations is found to be positively associated with informal loan amount in the case of India.

Then estimation is done using only mutual-max fairness variable and the results are reported in Table 7.25. Again in columns 1 and 3 income difference is used as an

explanatory variable, whereas in columns 2 and 4 (for India and China) log of income difference is used. Important inferences are mentioned as following:

1. In the case of both the countries, for the estimations related to all the columns, mutual-max is found to be positively associated with informal loan amount and now this is significant in the case of India and nearly so in the case of China (one sided test) . Thus significant support of hypothesis (b) is obtained.

2. In the case of both the countries, for the estimations related to the columns 1 and 3, income difference is found to be positively associated (nearly significant in the case of China) with informal loan amount. This result is in conformity with the hypothesis (a). However when log of income difference is used as an explanatory variable, it loses its significance as shown in columns 2 and 4.

3. Other inferences are similar to the results mentioned in points 5 and 6 for the estimations, when all the fairness variables are used.

Table 7.25: Informal Loan Amount and mutual-max Reciprocity

Dependent variable: Log Informal Loan amount	**India (1)**		**India(log y diff)(2)**		**China (3)**		**China (log y diff) (4)**	
	Coef.	t	Coef.	t	Coef.	t	Coef.	T
Age	0.10	1.56	0.10	1.53	0.10	0.13	0.06	0.08
Age sq	0.00	-1.6	0.00	-1.56	0.01	0.05	0.02	0.11
Household size	0.00	-0.1	-0.01	-0.17	-0.05	-0.52	-0.06	-0.6
Education	0.10	0.57	0.10	0.55	-0.05	-0.26	-0.06	-0.3
Log asset	0.39	1.52	0.36	1.39	0.29	1.53	0.30	1.61
Log income	0.73*	1.85	0.29	0.96	0.57	1.69	0.25	0.97
Risk share	0.44*	1.84	0.40	1.66	-0.05	-0.18	-0.03	-0.1
Abs risk coeff	-1.27	-1.41	-1.49	-1.67	-0.23*	-2.43	-0.2*	-2.5
Credit constraint	0.20	0.23	0.24	0.29	5.27*	4.34	5.2*	4.31
Loan risk manage	-0.63	-1.33	-0.69	-1.46	-0.76	-1.76	-0.76	-1.7
Loan production	-1.72*	-3.9	-1.77*	-4	-1.15*	-2.72	-1.1*	-2.6
Income difference(exp-4)	0.1*	2.27	0.80	1.64	0.05*	1.86	0.59	1.12
mutual-max	1.45*	2.38	1.43*	2.35	1.40	1.32	1.52	1.44
Default informal	0.47	0.41	0.60	0.53	2.41	1.16	2.55	1.22
Region6	0.22	0.39	0.37	0.65				
Region	1.08	2.3	1.10*	2.33				
Region9	0.75	1.55	0.82	1.68	-1.22	-3.56	-1.3*	-3.9
_cons	-9.19	-1.59	-14.10	-1.52	-4.22	-1	-7.60	-0.9

Table 7.25 (continued)

India (1): N = 312; F (19, 292) = 6.48; Prob > F = 0.00; Adj R-squared = 0.25
India (2): N = 312; F (19, 292) = 6.43; Prob > F = 0.00; Adj R-squared = 0.25
China (3): N = 342; F (17, 292) = 5.62; Prob > F = 0.00; Adj R-squared = 0.19
China (4): N = 342; F (17, 292) = 5.50; Prob > F = 0.00; Adj R-squared = 0.18

Then estimation is done using only mutual-min fairness variable and the results are reported in Table 7.26. Again in columns 1 and 3 income difference is used as an explanatory variable, whereas in columns 2 and 4 (for India and China) log of income difference is used. Important inferences are mentioned as following:

1. In the case of India, mutual-min is found to be positively associated with informal loan amount. This finding gives evidence against the hypothesis (c). However, in the case of China, mutual-min is found to be negatively associated with informal loan amount. This result gives significant support to hypothesis (c). Thus a mixed result is obtained for the mutual-min reciprocity.

2. In the case of both the countries, for the estimations related to the columns 1 and 3, income difference is found to be positively associated (nearly significant in the case of China) with informal loan amount. This result is in conformity with the hypothesis (a). However when log of income difference is used as an explanatory variable, it loses its significance as shown in columns 2 and 4.

3. Other inferences are similar to the results mentioned in points 5 and 6 for the estimations, when all the fairness variables are used.

Hence for informal loan amount, significant results are obtained. In the first set of specifications when all the fairness variables are included in the regression, appropriate signs are obtained on mutual-max, but the coefficients are not significant. However in the second set of specifications when only mutual-max is used, positive and significant coefficients are obtained on it, particularly for India. Thus we get satisfactory evidence on hypothesis (b). Similarly when only mutual-min is used,

significantly positive coefficient is obtained in the case of India and significantly negative coefficient is obtained in the case of China. Thus results of India gives evidence rejecting hypothesis (c) whereas, the results of China support hypothesis (c) .Income difference is found to be positively associated with informal loan amount, but near significant results are obtained only in the case of China, thus weak evidence supporting hypothesis (c) is obtained.

Table 7.26: Informal Loan Amount and mutual-min Reciprocity

Dependent variable: Log Informal Loan amount	India (1)		India(log y diff)(2)		China (3)		China (log y diff) (4)	
	Coef.	t	Coef.	t	Coef.	t	Coef.	T
Age	0.09	1.37	0.09	1.35	0.19	0.24	0.15	0.18
Age sq	0.00	-1.49	0.00	-1.45	0.01	0.06	0.02	0.12
Household size	0.00	0.01	0.00	-0.07	-0.06	-0.68	-0.07	-0.8
Education	0.01	0.08	0.01	0.06	-0.16	-0.82	-0.17	-0.8
Log asset	0.42	1.63	0.38	1.49	0.16	0.83	0.17	0.88
Log income	0.77	1.95	0.31	1.02	0.66	1.96	0.35	1.34
Risk share	0.45	1.87	0.41	1.67	-0.02	-0.1	0.00	0.02
Abs risk coeff	-1.24	-1.37	-1.47	-1.64	-0.24	-2.47	-0.24	-2.5
Credit constraint	-0.01	-0.01	0.05	0.06	5.14	4.26	5.10	4.22
Loan risk manage	-0.55	-1.17	-0.61	-1.3	-0.78	-1.81	-0.77	-1.7
Loan production	-1.55	-3.5	-1.60	-3.61	-1.14	-2.68	-1.12	-2.6
Income difference(exp-4)	**0.10***	**2.38**	**0.85***	**1.73**	**0.05***	**1.82**	**0.56**	**1.08**
mutual-min	**1.89***	**2.41**	**1.84***	**2.33**	**-3.86***	**-2.51**	**-3.9***	**-2.5**
Default informal	1.33	1.13	1.45	1.22	2.68	1.26	2.81	1.32
Region6	0.64	1.26	0.80	1.58				
Region	1.55	2.9	1.55	2.89				
Region9	0.31	0.55	0.40	0.71	-0.10	-0.19	-0.17	-0.3
_cons	-9.71	-1.68	-14.90	-1.61	-1.59	-0.37	-4.64	-0.5

N = 323; F (18, 304) = 3.67; Prob > F = 0.00; Adj R-squared = 0.14
N = 323; F (18, 304) = 3.49; Prob > F = 0.00; Adj R-squared = 0.12
N =343; F (17, 325) = 5.54; Prob > F = 0.00; Adj R-squared = 0.18
N =343; F (17, 325) = 5.38; Prob > F = 0.00; Adj R-squared = 0.18

Essentially in the case of both the countries, mixed results are obtained related to the nature of associations of fairness reciprocation motives (mutual-max and mutual-min) with informal loan transactions in rural areas of developing countries. No significant association of mutual-max with informal loan percentage is observed. However

mutual-max is found to be positively and significantly associated with informal loan amount, which supports the hypothesis (b).

Mixed results are also obtained for the preferences for mutual-min reciprocity. Preferences for mutual-min reciprocity are found to be negatively (nearly significantly) associated with informal loan percentage. Further, mutual-min reciprocity is found to be negatively associated with informal loan amount in the case of China. These two results support hypothesis (c). However in the case of India, mutual-min is found to be significantly and positively associated with informal loan amount, which rejects hypothesis (c).

A summary of the inferences obtained from different methods is compiled in Table 7.27.

Overall quite satisfactory results are obtained, as the proposed hypotheses have not been rejected in most of the cases, except in one case. These empirical findings even not supporting the analytical results entirely, which have been developed using fairness equilibria framework, are nevertheless quite encouraging and supplements the existing literature that attempt to explain the underlying motives of informal financial transactions among friends and relatives in the rural areas of developing countries.

Table 7.27: Summary of Inferences on mutual-max and mutual-min and Informal Loan

Method	**Mutual-max is associated with higher value of informal loan outcome: hypothesis (b)**	**Mutual-min is associated with lower value of informal loan outcome: hypothesis (c)**
Propensity Score Method	Significant supporting results for informal loan percentage for India ; No significant results for China	Significant rejecting results for informal loan percentage for India ; No significant results for China
Propensity Score Method	Significant supporting results for informal loan amount for India; No significant results for China	Significant rejecting results for informal loan amount for India; No significant results for China
Propensity Score Method	Significant supporting results for proportion of the families taking informal loan; No significant results for China	Significant rejecting results for proportion of the families taking informal loan; No significant results for China
Density Function	Density functions for mutual-max=1 seem to dominate the density functions for mutual-max = 0, for informal loan percentage beyond 40 for both the countries. These finding supports the hypothesis.	Density functions for mutual-min=1 seems to dominate that for mutual-min= 0 in the case of India. This finding rejects the hypothesis. However, in the case of China the density functions for mutual-min=0 seems to dominate that for mutual-min= 1. This finding supports the hypothesis
Structural Regression Method	No significant results are obtained (for both the countries) for informal loan percentage, when all the fairness variables are simultaneously used.	No significant results are obtained (for both the countries) for informal loan percentage, when all the fairness variables are simultaneously used.
Structural Regression Method	No significant results are obtained (for both the countries) for informal loan percentage, when only mutual-max is used.	Satisfactory significant supporting results are obtained (for both the countries) for informal loan percentage, when only mutual-min is used.
Structural Regression Method	No significant results are obtained (for both the countries) for informal loan amount, when all the fairness variables are simultaneously used.	No significant results are obtained (for both the countries) for informal loan amount, when all the fairness variables are simultaneously used.
Structural Regression Method	Significant supporting results for informal loan amount for India, when only mutual-max is used; Nearly significant supporting results for China.	Significant rejecting results for informal loan amount for India, when only mutual-min is used; significant supporting results for China.

7.5. Conclusion

It has been emphasized that large numbers of families in rural areas of developing countries engage in informal lending and borrowings among friends and relatives. Also informal debts constitute a large percentage of total loan portfolios of these people. Many of these families depend on such borrowing as they are credit rationed in the formal market and also many of these families prefer informal loans. Analysis of household survey data from India and China reveals that– (i) informal loans are preferred by families having less assets and income, (ii) Informal loans are preferred by families who have been denied formal credit more often for lack of collateral, (iii) informal loans are of comparatively smaller size, (iv) more informal loans are taken by families who prefer taking loans from friends and relatives, and (v) informal loans are more often used for risk management purposes. These findings have important policy implications.

The main objective of this chapter is to analyze the significance and underlying motives of such informal financial transactions. A detail analysis and evidence related to risk sharing motives for these financial transactions have been presented in Chapter 6.

However risk sharing motive does not include social preferences such as altruism, trust, reciprocity and fairness, which seem to be important for such financial transactions. People gain utility both from material payoff and also from their belief on the notions of trust and reciprocity. The primary contribution of this chapter is to explain the fairness as an important motive underlying the informal financial transactions among relatives and friends. Using fairness equilibrium framework proposed by Rabin (1993), important results are obtained, which explain informal borrowing and lending as mutual-max fairness equilibrium (Rabin 1993) outcome. The outcomes are mutual –max when each person maximizes the other's material

payoffs. And hence if significance on mutual-max equilibrium is obtained then fairness can be advanced as an important motive for explaining such informal financial transactions.

These results are empirically tested using household survey data from China and India. In the survey conducted in India and China, specific questions were asked to families that would reveal whether the families have preferences for mutual-max or mutual-min social interactions. Overall about 75 percent families in China (65 percent in India) demonstrate preferences for mutual-max reciprocation, whereas these percentages for mutual-min reciprocation are respectively about 40 percent and 50 percent for China and India. These findings suggest that mutual-max equilibrium is more likely to evolve in the fairness equilibrium context and it may be an important explanation of risk sharing behaviors.

The preferences for mutual-max and mutual-min reciprocations are found to be not mutually exclusive in the case of both the countries. A large percentage of families are found to be showing preferences for both types of fairness reciprocities and also good number of families show preferences for neither of these. However it is also found that preference for mutual-max behaviors dominates the preference for mutual-min behavior. Further it has been also shown that social preferences for mutual-max and mutual-min can be explained by several demographic, socio-economic and other behavioral variables. Moreover both these preferences are positively correlated - implying that for a large number of people both these types of reciprocations go together.

Because of this complexity of overlapping preferences, first propensity score method is used to compare the outcomes of informal borrowings related to mutual-max and mutual-min fairness reciprocities. Using this method noteworthy results are obtained which are mentioned as following:

1. In the case of India, the percentages of informal loan, informal loan amount, and the percentage of families using such loans are significantly higher for families showing preferences for Mutual-max reciprocity in comparison to the families who do not show preferences for such reciprocity. In the case of China no such significant results are obtained.

2. However it is observed that in the case of India, all three outcomes are also significantly higher for the families showing preferences for mutual-min reciprocity in comparison to the families who do not show such preferences. This is against the conjecture. In the case of China, the results are similar but not significant. One reason may be that mutual-min and mutual-max categorization is not mutually exclusive. The propensity score method is used to make such assignments random conditional on observables, but apparently this method has its own limitations. Another reason may be that, informal lending and borrowing are driven by several motives and fairness motive is one among these.

3. But when the probability density graphs are plotted, it is observed that in the case of both the countries the density functions for Mutual-max=1 seem to dominate the density functions for Mutual-max = 0, for informal loan percentage beyond 40 .

Overall these findings give credence to assertion that fairness can be advanced as an important motive for explaining informal financial transactions.

Further structural regression equations are used to estimate the significance of fairness variables mutual-max, mutual-min and their interaction. For informal loan amount, satisfactorily significant results are obtained. In the first set of specifications when all fairness variables are included in the regression, appropriate signs are obtained on mutual-max, but the coefficients are not significant. However in the second set of specifications when only mutual-max is used, positive and significant coefficients are obtained on it, particularly for India. However, for mutual-min the results support the

proposed hypothesis in the case of China only and the results reject the hypothesis in the case of India. For informal loan percentage, no significant results are obtained for mutual-max reciprocity, but hypothesis supporting and nearly significant results are obtained for mutual-min. Income difference is found to be positively associated with informal loan amount. Essentially the results suggest that fairness reciprocation motives mainly preferences for Mutual-max significantly influence informal loans transactions in rural areas of developing countries.

Also the data reveals (Tables 7.12 and 7.16) that a substantial number of respondents would lend to a friend or relative even if that friend or relative had previously denied them a loan, and further would expect to be able to borrow from a friend or relative if they themselves had previously denied a loan. Further, on the margin the finding of a sub population (about 8%) that fall into the Mutual Min category does not allow us to fully refute the existence of a mutual min. These results, coupled with the strong categorization of Mutual Max lead us to believe that the informal financial transactions are also driven by the motives of altruism and not purely the fairness reciprocity as Rabin's model predicts. In totality Rabin's model of fairness and reciprocity when applied to explain the informal lending and borrowing is not perfect but this seems to be an excellent starting place to incorporate social preferences for explaining the informal lending and borrowing among relatives and friends.

Additionally the empirical investigations of the analytical results have been done using the household survey data from China and India. The rural areas of these countries are economically similar but socially and culturally different. Such similarities and dissimilarities facilitates in inferring the importance of the unobserved social and cultural factors shaping the underlying motives of informal financial transactions among friends and relatives in these areas. For example, the econometric analysis related with risk sharing motive for informal financial transactions present quite

similar results so far the sign and significance of various covariates are concerned. Whereas, such results for fairness motive (mutual-max and mutual-min) are different. One reason for this can be that, risk sharing motive depends only on material considerations, but fairness motives seem to be strongly influenced by social and cultural factors.

Important limitations of this chapter are:

1. The non availability of detail data set on informal lending, borrowings and repayment after realization of certain non covariant shocks makes the estimations of the coefficients and inferences approximate.

2. Preferences for fairness motives such as mutual-max and mutual-min are measured based on responses by heads of families on specific survey questions. However more insights can be gained by running field or laboratory experiments.

Future research working on these suggested improvements may further clarify the significance of various motives which sustain informal lending and borrowing among friends and relatives.

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Chapter 8: Conclusion

This dissertation's main motivation is to investigate the significance and mechanics of informal lending and borrowing among close acquaintances such as relatives and friends in the rural areas of developing countries. The term mechanics here has wide connotations in the sense that, this dissertation aspires to unravel the pertinent questions such as –(i) why do these families engage in such financial transactions; (ii) in what way the non availability of needed amount of credit can affect their various livelihood choices and why do these families need credit and insurance coverage for various production and risk management purposes and; (iii) why the issues related with risk sharing and consumption smoothing is a central concern for these families; and (iv) what are the underlying human motives that sustains such informal lending and borrowing. All these questions have important policy implications.

To address these questions in a tractable and comprehensible manner the dissertation is divided into chapters such that any one chapter conducts a detail enquiry into a pertinent question. The five key chapters in this dissertation are mentioned as following:

1. "Chapter 3: Credit Rationing: A Theoretical and an Empirical Analysis". This chapter's central objective is to investigate into the issues related with credit rationing in the formal credit markets of the rural areas, as large number of families engage in informal financial transactions because they are not able to get required amount of credit from the formal credit markets, such as banks and rural credit cooperatives.
2. "Chapter 4: Impact of Credit Constraints on Livelihood Choices". This chapter's central objective is to investigate into the question; in what way the non availability of needed amount of credit can affect their various livelihood choices.

3. "Chapter 5: The Economics of Risk Sharing and Consumption Smoothing". This chapter's central objective is to investigate into the question why the issues related with risk sharing and consumption smoothing is a central concern for these families and what the widely used mechanisms for that are.
4. "Chapter 6: The Economics of Informal Lending and Risk Sharing Motive". This chapter's central objective is to examine the risk sharing and consumption smoothing motive that may explain such informal financial transactions.
5. "Chapter 7: The Economics of Informal Lending and Fairness Motive". This chapter's central objective is to investigate whether the fairness reciprocity in terms of fairness equilibrium framework (Rabin, 1993) can be an important motive underlying the informal financial transactions among relatives and friends. This proposed line of research is the chief contribution of this dissertation.

Furthermore, in each of these chapters, the analytical results guided by the important objectives of the chapters have been empirically investigated using the household survey data from China and India and suitable econometric methods and appropriate identification strategies.

The significant findings of these chapters, limitations of the findings and proposed further research are summarized chapter wise as following. For the ease of reading the objectives of these chapters are reiterated.

8.1. Chapter 3: Credit Rationing: A Theoretical and an Empirical Analysis

The main objective of this chapter is to assess credit-rationing problem in formal credit markets of rural areas of developing countries.

Objective 1: Develop an analytical model that can explain both type I and type II credit rationing in the formal credit markets of the rural areas in the developing

countries. This analysis helps in understanding the significance of various factors that influence credit rationing of the families in these areas.

Using the asymmetric information framework and assuming that probability of a project's success positively depends on endowment vectors of a borrower, both type I and type II credit rationing have been demonstrated. It has been shown that market equilibrium is attained by usage of loan size, interest rate and collateral requirements as screening and incentive devices.

Objective 2: Understand the disaggregated welfare implications of such credit rationing. This will help in understanding, in what manner different types of families are affected by such credit rationing.

Welfare implications of credit rationing has been analyzed and it has been demonstrated that net welfare loss occurs in equilibrium in which the good type borrower sustains loss in the case of adverse selection and both good and bad type of borrowers may sustain loss in the case of moral hazard problem.

Objective 3: Analyze the price responsiveness of loan demand and also understand how it is associated with the household assets of a family. The analysis related with this objective and objective 2 have important policy implications related with Pareto improving interventions in these credit markets.

The analysis also suggests that the loan demand is price inelastic. It is further found that the absolute value of price responsiveness increases with interest rate and also it decreases with increasing value of family assets. Based on these findings it has been suggested that the policies which help in addressing these information asymmetry problems particularly loosening the incentive compatibility constraints of bad (poor) borrowers, such as loan guarantee, subsidies or other supports may increase efficiency.

Objective 4: Estimate the extent of credit rationing with the help of analytical results and by using household survey data from China and India and by employing suitable

econometric methods. This analysis helps in understanding the severity of credit rationing in the formal credit markets of these rural areas and also helps in learning the significance of various factors that can explain such credit rationing.

It has been found that large parts of people in these areas suffer from considerable amount of credit rationing. The survey data and econometric analysis suggests that about 65 percent rural households in India and about 56 percent rural households in China face credit rationing (both type I and type II) in the formal credit market. The significance of assets endowment and collateral posting ability has been found as important explanatory variables for credit rationing. More than 50 percent families in both the countries ascribed lack of collateral as the main reason for denial of formal loans. Also about 70 percent families in China and 35 percent families in India feel deterred to obtain formal loan because of high interest rates.

Objective 5: Investigate the prevalence of information asymmetry in the formal credit market of the rural areas of developing Countries. This analysis will help in validating the assumption of prevalence of information asymmetry in the formal credit markets of these areas. This asymmetric information framework has been used in Objective 1.

A test, positive correlation test, has been proposed to test for information asymmetry in these credit markets and significant results are obtained. The significance of these tests lie in presenting empirical evidence of prevalence of information asymmetry in formal credit markets in these economies although individual significance of adverse selection and moral hazard is not distinguished.

However the empirical findings would have been more robust if data on actual amount of collateral posted could have been obtained, but apparently this is difficult. Another improvement in empirical analysis can be made if some good instrument of interest rate is identified to take care of endogeneity of interest rate. Also if panel data on

observations are available then unobserved heterogeneities can be controlled and also adverse selection and moral hazard effects can be separated in assessing the prevalence of information asymmetry in the credit market. Future research may pick up on these ideas and can come up with more insights on functioning of credit markets.

8.2. Chapter 4: Impact of Credit Constraints on Livelihood Choices

Objective 1: Develop an analytical model that may help in understanding the effects of credit constraints on agriculture input applications.

Investigation of impacts of credit constraints on farm input applications has been done using a static optimization framework. The analysis demonstrates that a credit constrained farmer uses suboptimal amount of farm inputs when the credit constraint is binding. Furthermore, if credit constraint tightens beyond a threshold level then the farming may not be remunerative and he prefers wage labor.

Objective 2: Develop an analytical model that may help in understanding the effects of credit constraints on the wage market outcomes for the families living in rural areas of the developing countries.

Investigation of impacts of credit constraints on wage seeking has been done using a static optimization framework. The analysis demonstrates that when the credit constraint is binding and furthermore, if credit constraint tightens beyond a threshold level then the farming may not be remunerative and number of people prefers wage labor. However, increasing number of wage seekers put a downward pressure on wage and thus wage market outcome is also adversely affected.

Objective 3: Analyze the impact of credit constraints on various livelihood choices such as, capital investment (physical and human), consumption, leisure, and decision to either become an entrepreneur or wage seeker. This analysis has been done using

dynamic optimization framework. The process of borrowing, investment, outcome, consumption, and repayment evolves over time in an individual's life cycle. Hence learning the dynamics (and steady state equilibrium –if that exists) of these choice variables may strengthen our understanding of influence of borrowing constraints on above choices of an individual over her life cycle.

Analysis of impact of credit constraints on various livelihood choices such as, capital investment (physical and human), consumption, leisure, and decision to either become an entrepreneur or wage seeker has been done using dynamic optimization framework. The results demonstrate that credit constraints affect consumption smoothing, and physical capital and human capital accumulation are also adversely affected. Furthermore comparative levels of physical capital and human capital accumulation influence the decisions of becoming an entrepreneur or wage seeker.

Objective 4: Using household survey data from China and India, and suitable econometric methods; empirically investigate the effects of credit constraints on agriculture input applications, food security, and health and educational attainments.

Using suitable econometric methods and the household survey data from China and India it has been shown that credit constraints negatively affect food consumption, farm inputs applications, and health and educational attainments.

However the empirical findings would have been more robust if data can be obtained either pertaining to some natural experiment or ideally relating to a randomized experiment. However, it is difficult, expensive and time consuming to get access to such data sets. Also if panel data on observations are available then unobserved heterogeneities can be controlled. Future research may pick up on these ideas and can come up with more insights on impacts of credit constraints.

8.3. Chapter 5: The Economics of Risk Sharing and Consumption Smoothing

Objective 1: Analyze the risk sharing and consumption smoothing motivations of the families who live in rural areas of the developing countries. This analysis will help in understanding the importance of risk sharing and consumption smoothing motives in the presence of credit constraints and incomplete insurance markets.

Majority of the families living in rural areas of the developing countries are exposed to income process which is quite volatile showing high values of coefficient of variation. The coefficients of variation of farm income in both the countries are found to be around 34 percent, which is reasonably high. The survey data also reveals that the families in these areas face various types of risks and uncertainties. In absence of adequate access to credit and insurance arrangements often the income fluctuations (partially) translate into consumption fluctuations. The analysis shows that rational risk averse agents, having convex preferences over goods across various states and time periods, will like to smooth consumption across all states and time periods.

Objective 2: Investigate the risk sharing and consumption smoothing mechanisms of the families who live in rural areas of the developing countries. The three important mechanisms analyzed are – precautionary savings, risk sharing informal insurance and credit transactions.

In absence of well functioning credit and insurance markets, consumption smoothing is a big challenge for these families and they resort to various ex ante and ex post measures to smooth their consumptions. To smooth their consumption and satisfy other needs they usually take recourse to - (a) borrow from formal credit market, (b) do precautionary savings, (c) enter into mutual risk sharing arrangements, and (d) depend on informal borrowing from friends and relatives.

As large numbers of families are found to be credit constrained, hence the first option is of limited significance for risk management purpose. The three important

mechanisms used for risk management are; precautionary savings, risk sharing insurance and credit arrangements. These mechanisms have been separately analyzed in the chapter and useful results are obtained.

Objective 3: Using household survey data from China and India, and suitable econometric methods; empirically investigate the significance of the variables associated with these mechanisms.

Satisfactory evidences of life cycle and precautionary motives for savings are obtained. Higher level of household assets and income are found to be positively associated with the savings. Also higher values of absolute risk aversion are found to be positively associated with the savings. It is also observed that a large number of families are not able to save but they seem to attach high importance to the savings.

Also significant evidences are obtained related to risk sharing insurance arrangements and risk sharing credit arrangements. It has been observed that in both the countries more than 70 percent families and 90 percent families have engaged in gift transactions and loan transactions respectively in emergencies. This demonstrates that people do share risk on a large scale and moreover preference for loan transaction dominates.

Further the empirical investigation suggests that the informal loan amount decreases with increasing uncertainty in income process and also with increasing risk aversion of the agents. However, we could not get supporting inferences for positive association of informal loan amount with repayment factor.

Objective 4: Using household survey data from China and India and the analytical results, empirically estimate the willingness of the families to pay for insurance coverage (in lieu of a steady income process) as a proportion of their annual income.

An estimate of coefficient of relative risk aversion and coefficient of absolute risk aversion are needed to measure the risk premium and optimal informal loan amount.

Risk premium is defined as the minimum amount which a risk averse agent is willing to pay to avoid fluctuations in her consumption across dates. The coefficients of relative risk aversion of the people have been estimated using a survey question related to Binswanger (1981) experiment and also using further approximations. It is acknowledged that this way of measuring relative risk aversion coefficient may not be rigorous, however for the limited purpose of estimating risk premium of the households this may be adequate. Apparently higher level of household assets, income, and education level are associated with lower level of risk aversion. Also the level of risk aversion seems to be increasing with age of the respondent.

Using the survey data from China and India, the magnitude of the proportionate risk premium is computed which is found to be in the range of 15-20 percent. This demonstrates that risk is a major concern for rural people and they are willing to pay for insurance coverage as high as 15- 20 percent of annual income.

However, some of the weaknesses of the estimations are as following:

4. The coefficients of relative risk aversion and absolute risk aversion of the families are measured approximately. Rigorous estimations of these coefficients using repeated observations on the choices made by the families related to consumption and production activities (Bar-Shira et.al., 1997) may improve the inferences on the results.
5. The variability of income of the households is also measured based on the perceptions of the families. Here also using repeated observations on income, may give better measurement of the variance of households' income.
6. Also in a cross section data, we are not able to control for the unobserved heterogeneities of the households. The availability of panel data may resolve the omitted variable bias caused by this inadequacy.

However this chapter provides helpful insights on risk the sharing and consumption smoothing motivations and mechanisms of the families living in rural areas of developing economies.

8.4. Chapter 6: The Economics of Informal Lending and Risk Sharing Motive

Objective 1: Investigate the significance of informal lending and borrowing among friends and relatives in rural areas of the developing countries. This analysis helps in understanding the magnitude of informal financial transaction among friends and relatives in these areas.

It has been observed that in both the countries more than 70 percent and 90 percent families have engaged in gift and loan transactions respectively in emergencies. This demonstrates that people do share risk on a large scale and moreover preference for loan transaction dominates.

Analysis of household survey data from India and China about informal loans reveal that– (i) these are preferred by families having less assets and income, (ii) these are preferred by families who have been denied formal credit more often for lack of collateral, (iii) these loans are of comparatively smaller size, (iv) these loans are often taken by families who prefer taking loans from friends and relatives, and (v) informal loans are more often used for risk management purposes. These findings have important policy implications.

Objective 2: Develop and analytical framework to investigate the risk sharing and consumption smoothing motive that may explain such informal financial transactions. This analysis helps in understanding the mechanics of informal financial transactions and also helps in characterizing the loan amount, state contingent repayments, and default rates in equilibrium.

A detail analysis of risk sharing motive for informal lending and borrowing among friends and relatives has been presented, and useful results are obtained. This line of reasoning explains it as a sub game perfect equilibrium outcome of repeated interactions among the households. The primary contribution of this chapter is to characterize the loan amount, state contingent repayments, and default rates in equilibrium.

Objective 3: Using household survey data from China and India, and suitable econometric methods; empirically investigate the significance of the risk sharing motive explaining the informal lending and borrowing among friends and relatives.

To test for risk sharing ideally the data on loan transactions among friends and relatives after some shocks are needed. Also observations on repayment and default are needed. However, collecting such data is greatly time consuming and arduous. To resolve this problem, a simple strategy is devised, that may identify risk sharing motive. The identification strategy employed is that lower the income of a family from the average village income is more the informal borrowing will be done by that family for risk management. This is the best approximation achieved in the absence of availability of data on partner's income with whom a particular household is doing financial transactions. For both the countries significant evidences are obtained related to risk sharing motives explaining informal lending and borrowing.

However, for improved inferences on the risk sharing motives of informal loan transactions following suggestions are made:

1. For better inferences on risk sharing motives, data on loan transactions among friends and relatives after some shocks are needed. Also observations on repayment and default are needed.

2. Also in a cross section data, we are not able to control for the unobserved heterogeneities of the households. The availability of panel data may resolve the omitted variable bias caused by this inadequacy.

3. Well measured values of the coefficients of relative risk aversion and absolute risk aversion of the families (as suggested in the Chapter 5) may help us in understanding the nature of associations of risk aversion of the families and informal loan transaction among friends and relatives.

Despite these limitations, this chapter provides helpful insights on risk sharing motives of informal lending and borrowing among close acquaintances of the families living in rural areas of developing economies.

8.5. Chapter 7: The Economics of Informal Lending and Fairness Motive

Objective 1: Risk sharing motive does not include social preferences such as altruism, trust, reciprocity and fairness, which seem to be important for these financial transactions. A growing body of evidence in literature suggests that people are also strongly motivated by these social preferences (apart from material gains) which can not be ignored in social interactions[47]. Hence it is important to understand the significance of these social preferences that may supplement our understanding of the underlying motives that sustain the informal financial transactions among relatives and friends in rural areas of the developing countries.

In the survey conducted in India and China, specific questions were asked to families that would reveal various social preferences of the families related to lending and borrowing among friends and relatives. The summary statistics of these social preferences are presented in Table 8.1 for India and in Table 8.2 for China. Evidently the social preferences such as altruism, trust, reciprocity, and fairness seem to be quite

[47] For a good review see Fehr and Schimdt (2006)

significant which may partly explain informal financial transactions among friends and relatives in rural areas of the developing countries.

Table 8.1: Summary Statistics of Important Social Preference Variables (India)

Variable (Binary Variables ; 1=yes, 0=no)	Comment	Obs	Mean	Std. Dev.
Trusts that informal loan will be rapid (trust1)	Trust	399	0.79	0.40
Will lend even does not trust that loan will be repaid(trust2)	Altruism	399	0.45	0.50
Will lend or borrow even they have refused earlier (alt1)	Altruism	399	0.79	0.41
Stronger version (and conditions) of (alt1)	Altruism	399	0.27	0.45
Strong guilty feeling on defaulting informal loan	Reciprocity	399	0.30	0.46
Strong guilty feeling on defaulting formal loan	Reciprocity	399	0.32	0.45
Mutual-min Reciprocity	fairness	399	0.51	0.50
Mutual max Reciprocity	fairness	398	0.64	0.48
Mutual max and Mutual-min Reciprocity	fairness	399	0.44	0.50

Note: In the scale of 1-8, Strong guilty feelings, corresponds to value 8

Table 8.2: Summary Statistics of Important Social Preference Variables (China)

Variable (Binary Variables ; 1=yes, 0=no)	Comment	Obs	Mean	Std. Dev.
Trusts that informal loan will be rapid (trust1)	Altruism	1535	0.90	0.30
Will lend even does not trust that loan will be repaid(trust2)	Altruism	1538	0.62	0.49
Will lend or borrow even they have refused earlier (alt1)	Altruism	740	0.81	0.39
Stronger version (and conditions) of (alt1)	Reciprocity	740	0.52	0.50
Strong guilty feeling on defaulting informal loan	Reciprocity	1540	0.54	0.50
Strong guilty feeling on defaulting formal loan	fairness	1540	0.44	0.50
Mutual-min Reciprocity	fairness	741	0.40	0.49
Mutual max Reciprocity	fairness	741	0.73	0.45
Mutual max and Mutual-min Reciprocity		1540	0.15	0.36

Objective 2: Develop an analytical model using fairness equilibrium framework proposed by Rabin (1993) to explain the fairness reciprocity as an important motive underlying the informal financial transactions among relatives and friends. Here outcomes are mutual –max when each person maximizes the other's material payoffs and mutual-min when each person minimizes the other's payoff. And hence if mutual-max equilibrium dominates the mutual-min equilibrium, then fairness can be advanced as an important motive for explaining such informal financial transactions. Informal borrowing and lending can be explained as mutual-max fairness equilibrium outcome.

Using fairness equilibrium framework proposed by Rabin (1993), an analytical model is developed which gives two important results – (i) When both participants feel hostile to each other then in one shot game of lending, borrowing and repayment game, no lending, borrowing or repayment takes place. This is mutual-min fairness equilibrium. (ii) When both participants have kind feelings for each other then lending and borrowing sustains even in one shot game. Strictly positive amount of lending, borrowing, and repayment take place. This is mutual-max fairness equilibrium. Thus this analysis explains informal borrowing and lending as mutual-max fairness equilibrium (Rabin 1993) outcome. Moreover the mutual-max fairness equilibrium works well if the ratio of endowments of agents is bounded between 1 and 2.30, as too much income differences may prompt bigger default with larger sums of money in one shot game.

Objective 3: Using household survey data from China and India and suitable econometric methods and appropriate identification strategies; empirically investigate the results related to fairness reciprocation (mutual-max and mutual-min) motives and informal lending and borrowing. In the survey conducted in India and China, specific questions were asked to families that would reveal whether the families have preferences for mutual-max or mutual-min social interactions.

Using household survey data from China and India and suitable econometric methods, the empirical findings suggest mixed evidences on fairness reciprocity as underlying motives for these informal financial transactions. These findings are discussed as following:

1. Overall about 75 percent families in China (65 percent in India) demonstrate preferences for mutual-max reciprocation, whereas these percentages for mutual-

min reciprocation are respectively about 40 percent and 50 percent for China and India. These findings suggest that mutual-max equilibrium is more likely to evolve in the fairness equilibrium context and it may be an important explanation of informal financial transactions.

2. Social preferences for mutual-max and mutual-min can be explained by several demographic, socio-economic and other behavioral variables. Moreover both these preferences are positively correlated, implying that for a large number of people both these types of reciprocations go together, that may depend on the circumstances of interactions.
3. However, in the aggregate preferences for mutual-max dominate. The preferences for mutual-max and mutual-min reciprocations are found to be not mutually exclusive in the case of both the countries. A large percentage of families are found to be showing preferences for both types of fairness reciprocities and also good number of families show preferences for neither of these.
4. Because of this complexity of overlapping preferences, first propensity score method is used to compare the outcomes of informal borrowings related to mutual-max and mutual-min fairness reciprocities. Using this method noteworthy results are obtained which are mentioned as following.
    a. In the case of India, the percentages of informal loan, informal loan amount, and the percentage of families using such loans are significantly higher for families showing preferences for Mutual-max reciprocity in comparison to the families who do not show preferences for such reciprocity. In the case of China no such significant results are obtained.
    b. However it is observed that in the case of India, all three outcomes are also significantly higher for the families showing preferences for mutual-min reciprocity in comparison to the families who do not show such

preferences. This is against the conjecture. In the case of China, the results are similar but not significant. One reason may be that mutual-min and mutual-max categorization is not mutually exclusive. The propensity score method is used to make such assignments random conditional on observables, but apparently this method has its own limitations. Another reason may be that, informal lending and borrowing are driven by several motives and fairness motive is one among these.

c. But when the probability density graphs are plotted, it is observed that in the case of both the countries the density functions for Mutual-max=1 seem to dominate the density functions for Mutual-max = 0, for informal loan percentage beyond 40.

d. Overall these findings give credence to assertion that fairness can be advanced as an important motive for explaining informal financial transactions.

5. Further structural regression equations are used to estimate the significance of fairness variables mutual-max, mutual-min and their interaction. For informal loan amount, satisfactorily significant results are obtained. In the first set of specifications when all fairness variables are included in the regression, appropriate signs are obtained on mutual-max, but the coefficients are not significant. However in the second set of specifications when only mutual-max is used, positive and significant coefficients are obtained on it, particularly for India. However, for mutual-min the results support the proposed hypothesis in the case of China only and the results reject the hypothesis in the case of India. For informal loan percentage, no significant results are obtained for mutual-max reciprocity, but hypothesis supporting and nearly significant results are obtained for mutual-min. Essentially the results suggest that fairness reciprocation motives mainly

preferences for Mutual-max significantly influence informal loans transactions in rural areas of developing countries.

Also the data reveals (objective 1) that a substantial number of respondents would lend to a friend or relative even if that friend or relative had previously denied them a loan, and further would expect to be able to borrow from a friend or relative if they themselves had previously denied a loan. Further, on the margin the finding of a sub population (about 8%) that fall into the Mutual Min category does not allow us to fully refute the existence of a mutual min. These results, coupled with the strong categorization of Mutual Max lead us to believe that these informal financial transactions are also driven by the motives of altruism and not purely the fairness reciprocity as Rabin's model predicts. In totality Rabin's model of fairness and reciprocity when applied to explain the informal lending and borrowing is not perfect but this seems to be an excellent starting place to incorporate social preferences for explaining the informal lending and borrowing among relatives and friends.

Important limitations of this chapter are:

1. The non availability of detail data set on informal lending, borrowings and repayment after realization of certain non covariant shocks makes the estimations of the coefficients and inferences approximate.

2. Preferences for fairness motives such as mutual-max and mutual-min are measured based on responses by heads of families on specific survey questions. However more insights can be gained by running field or laboratory experiments.

Future research working on these suggested improvements may further clarify the significance of various motives which sustain informal lending and borrowing among friends and relatives.

Overall this dissertation successfully enquires into the various pertinent issues related with widely observed phenomena of informal lending and borrowing among friends and relatives in the rural areas of developing countries. This dissertation makes key contribution in exploring the significance of underlying motives for such informal financial transactions. Particularly the significance of various social preferences, apart from risk sharing motive which is exclusively driven by the material gain considerations, has been highlighted. Among these the investigation of the fairness reciprocity, in terms of fairness equilibrium framework (Rabin, 1993), as an important motive underlying the informal financial transactions among relatives and friends, supplements the existing knowledge in this field.

Also the empirical investigations of the analytical results have been done using the household survey data from China and India. The rural areas of these countries are economically similar but socially and culturally different. Such similarities and dissimilarities facilitates in inferring the importance of the unobserved social and cultural factors shaping the underlying motives of informal financial transactions among friends and relatives in these areas. For example, the econometric analysis related with risk sharing motive for informal financial transactions present quite similar results so far the sign and significance of various covariates are concerned. Whereas, such results for fairness motive (mutual-max and mutual-min) are different. One reason for this can be that, risk sharing motive depends only on material considerations, but fairness motives seem to be strongly influenced by social and cultural factors.

APPENDIX 1

Cornell University/Northwest Agriculture and Forestry University Survey of Villagers to Assess Specific Credit Rationing Issues, Informal Lending among Friends and Relatives, and Interest in Weather insurance and Health Insurance

(Original Version)

NARRATIVE TO BE READ TO RESPONDENTS: First of all I would like to thank you for taking the time to meet with us. This survey should take approximately 50 minutes and again I thank you for your time. The survey we are conducting is a joint product between Cornell University in the United States and Northwest Agriculture and Forestry University. We are interested in collecting information about the problems that you face from credit rationing/ borrowing constraints from banks and PAC and the way you respond to them by engaging in informal lending among your friends and relatives. We are also interested in the relationships between these risks and your interest and ability to obtain weather and health insurance. Your responses will be completely confidential and under no circumstances will your responses be identifiable. In addition we understand that you may not have all of the precise information available. In these cases all we ask is that you provide us with your best estimates or best judgments. Finally, you have the right to refuse to answer any question we might ask.

Given these objectives are you willing to participate in this survey? Yes No

If NO then "*Ok, that is fine. For our records can you tell us why you do not want to participate?*

NOTE to interviewer: If answer above is because respondent does not feel they have the information we need then ask why and explain again that we only require a best effort on their part, and that we expect that not all respondents will have precise information. And then ask if they will reconsider.

NOTE to interviewer: If answer above is related to privacy issues, then remind respondent that their participation will be most helpful to our research and that they will remain anonymous and that their privacy is guaranteed. And then ask if they will reconsider.

IF YES…." *Thank you very much for your consent. Let us begin. We would like to start off by asking some general questions about your farm household*"……. Go to question 1.

A: Farm Characteristics and Farmer Risk Attitude

0. a. Sex of the head of household. _____Male; _____Female.

0. b. What is your age _____.

1. From what village are you reporting? _____

2. How many years have you been farming? _____

3. What is the total size (1 acre = 6.07 Mu) of your farm? _____

4. Please list the top five crops and sales in order of revenue from the most valuable to the least valuable

Rank	Crop	Total Sales
1		
2		
3		
4		
5		

5. Is your farm your major source of income?_____ Yes _____ No.

6. What was the total household income in the past year from all sources (best guess)

_____

7. Please approximate the percent of your income in Q4 from your entire farming operation _____ (INTERVIEWER: Prod for this number. If they do not know exactly then say "we do not need an exact number just an approximate number" or "was it less or more than 50%, less than 25% etc until a number is obtained.)

8. Including yourself how many people live in this house _____ (*INTERVIEWER: this is the total number of people sharing the house of the respondent including children, parents etc.)*

9. Among Children in the household
    a. How many are in elementary school?_____,
    b. How many are in high school? _____,
    c. How many are in college (university)? _____.

9. 0. What is your highest education level: a) Never Went to School___ b)Some elementary school ___ c) Completed Elementary School_____ d) Some high school____ e) Completed High School ___ f) Some University or college____ g) Completed College or University____.

10. In your house is there a family member suffering from severe sickness? YES_____, NO___

INTERVIEWER "Thank you that is very helpful. Now I would like to ask you some questions about your attitudes towards risk and the risks that you face on your farm"

B. Sources of Risk and Risk Perceptions

11. Please indicate if you are willing or not willing to take risks (Circle the most appropriate response).

Statement	**Not Willing to Take Risk**		**Neutral to Take risk**		**Willing to Take Risk**
I am willing to accept greater production risks to increase the chance of higher profits	1	2	3	4	5
I am willing to take risks with new technologies before I see good results in other farms	1	2	3	4	5
I am willing to take risks with new management practices before I see good results in other farms	1	2	3	4	5

12. For each of the crops listed in question 4, identify the lowest price you believe possible, the price that you believe is most likely to be received, and the highest possible price you believe possible in the next crop year (2008) *(INTERVIEWER: Read back crops as listed in Q4 and for each crop prod the respondent for lowest, most likely and highest: you may say things like 'we do not need the exact numbers, just your own personal judgment about what the prices might be' by most likely price ask them what price they expect to receive in the next harvest. Note: most likely can be the same as lowest and highest)*

Crop	Lowest possible price	Most likely price	Highest possible price
1			
2			
3			
4			
5			

13. For each of the crops listed in question 4, identify the lowest yield you believe possible, the yield that you believe is most likely to be received, and the highest possible yield you believe possible in the next crop year (2008) *(INTERVIEWER: Read back crops as listed in Q4 and for each crop prod the respondent for lowest, most likely and highest: you may say things like 'we do not need the exact numbers, just your own personal judgment about what the yields might be' by most likely yield ask them what yield they expect to receive in the next harvest. Note: most likely can be the same as lowest and highest)*

Crop	Lowest possible yield	Most likely yield	Highest possible yield
1			
2			
3			
4			
5			

14. Please indicate how important each of the following weather events is in causing your yields to fall below expectations during the planting, growing or harvesting periods. Use a 1 to 5 scale with 1 = not important, 2 = less important, 3 = neutral, 4 = important, and 5 = very important (Circle the most appropriate response).

(INTERVIEWER: Read back each month to respondent and prod for not important etc). Do deficit in rainfall first and then repeat for excessive rainfall)

	Deficit in Rainfall (Less Than Desirable)					Excessive Rainfall (More Than Desirable)				
Months	Not Important				Very Important	Not Important				Very Important
January	1	2	3	4	5	1	2	3	4	5
February	1	2	3	4	5	1	2	3	4	5
March	1	2	3	4	5	1	2	3	4	5
April	1	2	3	4	5	1	2	3	4	5
May	1	2	3	4	5	1	2	3	4	5
June	1	2	3	4	5	1	2	3	4	5
July	1	2	3	4	5	1	2	3	4	5
August	1	2	3	4	5	1	2	3	4	5
September	1	2	3	4	5	1	2	3	4	5
October	1	2	3	4	5	1	2	3	4	5
November	1	2	3	4	5	1	2	3	4	5
December	1	2	3	4	5	1	2	3	4	5

15. Please indicate how important each of the following weather events is in causing your yields to fall below expectations during the planting, growing or harvesting period. Use a 1 to 5 scale with 1 = not important, 2 = less important, 3 = neutral, 4 = important, and 5 = very important (Circle the most appropriate response).

(INTERVIEWER: Read back each month to respondent and prod for not important etc). Do excessive heat first and then repeat for cold weather)

	Excessive Heat (Hotter Than Desirable)					Cold Weather (Cooler Than Desirable)				
Months	Not Important				Very Important	Not Important				Very Important
January	1	2	3	4	5	1	2	3	4	5
February	1	2	3	4	5	1	2	3	4	5
March	1	2	3	4	5	1	2	3	4	5
April	1	2	3	4	5	1	2	3	4	5
May	1	2	3	4	5	1	2	3	4	5
June	1	2	3	4	5	1	2	3	4	5
July	1	2	3	4	5	1	2	3	4	5
August	1	2	3	4	5	1	2	3	4	5
September	1	2	3	4	5	1	2	3	4	5
October	1	2	3	4	5	1	2	3	4	5
November	1	2	3	4	5	1	2	3	4	5
December	1	2	3	4	5	1	2	3	4	5

INTERVIEWER "Thank you very much for those responses. This is most helpful. Now I would like to ask you some questions about how you manage these risks.

C. Risk Management Options Use and Perceptions

16. Please indicate how **important** you believe each item to be in terms of risk management in your farm. Then, mark an "X" if **you do not use** this to manage risk in **your** operation. Scale with 1 = not important, 2 = less important, 3 = neutral, 4 = important, and 5 = very important (Circle the most appropriate response).

Statement	X (Not used)	Not Important				Very Important
More than one crop, animal, or enterprise diversification		1	2	3	4	5
Fields or farms in different locations (geographic diversification)		1	2	3	4	5
Irrigation		1	2	3	4	5
Spreading sales: selling each product over a period of time rather than all at once (diversified marketing)		1	2	3	4	5
Using contracts to market your crop in advance at a fixed price		1	2	3	4	5
Government programs		1	2	3	4	5
Maintaining financial reserves: having cash and readily convertible assets(e.g. machineries, livestock)		1	2	3	4	5
Investing off-farm for other sources of income		1	2	3	4	5

D. Crop Insurance Use and Perceptions

INTERVIEWER: Crop insurance is a common tool used by western farmers. Crop insurance will pay you if your crop yield falls below some percentage of your average yields. For example if your yield is 1,000 kg/ Mu for a particular crop, insurance may provide a payment if actual crop yield falls below 70% of this average. For example if actual yield is 500Kg then you would receive a payment based on the difference between 700kg and 500 kg (200kg) times the average harvest price. If the price is 5Yuan then you would receive 5(700-500)=RMB1,000 but if yields are above 700kg you receive nothing.*

17. If crop insurance were offered in China do you think that you would purchase crop insurance?

_____ Regularly _____ Occasionally _____ Some years _____ Not at all.

18. Considering all aspects of the household including the farm, operations, house, contents, automobiles, machinery and equipment do you regularly purchase insurance for any of the following items:

    a. Life Insurance Yes_____ No____

    b. Fire insurance for home and contents Yes_____ No____

    c. Automobile Insurance **Yes_____** **No____**
    d. Health/Medical Insurance **Yes_____** **No____**
    e. Protection against crop loss (crop insurance) **Yes_____** **No____**
    f. Protection against livestock loss (livestock insurance) **Yes_____** **No____**
    g. Other _____

Weather-Based New Insurance Products

INTERVIEWER: New types of insurance products based on excessive rainfall, deficit rainfall, excessive heat or cold weather are being evaluated for potential use in agriculture. For example, if you buy deficit rainfall insurance, you will receive a payment if the number of inches of rain that fall in your farm during a month or a season is less than what you expected. The money you will get is based only on how much shortfall in rainfall you will experience. It is not based on how much yield shortfall you experience. Your insurance contract will be written based on the historical rainfall data at your local weather station or if possible on a weather station on your farm.

19. Please indicate your level of interest in a risk management tool for which would you pay a fair price and receive a payment under the following weather events. Scale with 1 = No interest, 2 = Slight interest, 3 = Moderate interest, 4 = High interest, and 5 = Very high interest (Circle the most appropriate response).

Weather Events	No Interest				Very High Interest
Excessive Rainfall at critical point in time	1	2	3	4	5
Excessive Heat at critical point in time	1	2	3	4	5
Deficit in Rainfall over a period of time	1	2	3	4	5
Cold Weather over a period of time	1	2	3	4	5
High winds	1	2	3	4	5
Other (Please list_____)	1	2	3	4	5

20. Please indicate how important is the stage of operation you would consider protecting with weather insurance. Use a 1 to 5 scale with 1 = not important, 2 = less important, 3 = neutral, 4 = important, and 5 = very important (Circle the most appropriate response).

Stages of Operation	Not Important				Very Important
Planting	1	2	3	4	5
Growing	1	2	3	4	5
Harvesting	1	2	3	4	5

21. From where do you usually get your temperature and precipitation information?
    a) I do not receive weather forecasts _____
    b) Local weather station _____
    c) Weather station on your farm _____
    d) Television _____
    e) Radio _____
    f) Other sources (Please list _____)
22. To the best of your knowledge, please approximate how far the local state or government weather station is from your farm.

a. Kilometers _____

b. If you do not know distance, please enter Village or Location or nearest weather station _____

c. Don't know _____

23. To the best of your knowledge, how do rainfall and temperature readings (throughout the summer) recorded at the closest known weather station correspond, with the actual rainfall and temperatures at your farm?

____Very Similar ____ Fairly Similar ____ A Little Similar ____ Not at all Similar ____ Don't know

F. Farm Finance and Risk Management

24. Do you have any debt outstanding? YES ____ NO ____

25. IF YES please indicate the total amount of money you owe including money owed to friends, relatives, money lenders, RCC and commercial banks

_____

26. If YES Please indicate your farm total debt as a proportion of total assets last year.

____ 0-20% ____ 21-25% ____ 26-30% ____ 31-35%____ 36-40%

____ 41-45% ____ 46-50% ____ 51-60% ____ 61-70% ____ Over 70%

_____ Don't Know

27. If you sell all your assets (home, land, livestocks, agriculture produce etc.) how much will you get (in RMB) _____.

INTERVIEWER: This may be a difficult question to answer because it places a value on the asset values. If respondent does not know or does not understand, simply enter Don't Know

28. If Yes Can you please provide the approximate percentage owed to (actually 27)

a. Relatives, _____

b. Friends _____

c. Money lender, _____

d. RCC _____

e. Banks _____

f. Other _____

INTERVIEWER: Prod to get 100% from a through d. If too difficult then place

difference between sum of a+b+c+d and 100 in 'other': If you cannot get percentages then prod respondent for actual numbers in RMB.

29. Regarding to your current total amount of debts, assets and productivity, what do you think about your debt level? (Use a 1 to 5 scale with 1 = very low, 2 = low, 3 = adequate, 4 = high, and 5 = very high (Circle the most appropriate response).

1 = very low, 2 = low, 3 = adequate, 4 = high, 5 = very high

30. INTERVIEWER "*This is very helpful. Now I would like to ask you about interest rates charged on the most recent loan that you have had by source. For each of lender types I will list I would like you to provide the 'ACTUAL' interest rate charged. If you have not borrowed from the lender type I would like you to indicate the interest rate that you 'BELIEVE' would be charged by the lender. What you believe could be based on rates that you have heard from friends or relatives, or any other source that you believe reliable."* (INTERVIEWER: In each case read 'ACTUAL', 'BELIEVE', 'DON'T KNOW')

a. Relatives: ACTUAL _____BELIEVE_____ DON'T KNOW _____
b. Friends: ACTUAL _____BELIEVE_____ DON'T KNOW _____
c. Money Lender: ACTUAL _____BELIEVE_____DON'T KNOW _____
d. RCC: ACTUAL _____ BELIEVE_____DON'T KNOW _____
e. Banks: ACTUAL _____ BELIEVE_____ DON'T KNOW _____
f. Other: ACTUAL _____ BELIEVE_____ DON'T KNOW _____

31. Have you ever been denied a loan by RCC or bank? Yes_____ No_____
32. If yes what are the major reasons you were denied credit (answer more than one if necessary)?
    a. Insufficient collateral _____
    b. Crops/Livestock subject to too much price risk _____
    c. Subject to too much yield risk. _____
    d. The crop grown are vulnerable to the extreme weather . _____
    e. I have failed to repay the loan in the past. _____
    f. Bank does not believe I am trustworthy ._____

g. My bank doesn't believe that I earned enough income _____

h. The repayment schedule required by RCC does not match the timing of sales from my farm. ____

33. Have you been able to obtain as much credit **as you need** from RCC or bank?

a. Never _____

b. Sometimes _____

c. If b. "approximately what percentage of loans that you ask for are provided in the full amount that you requested _____

d. Always _____

34. Have you ever been late in repaying a loan? (INTERVIEWER: By 'being late' we mean that payment was not promptly paid as agreed upon by the lender, but payment was eventually made)

a.	Relative	Yes _____	No____
b.	Friend	Yes _____	No____
c.	Money Lender	Yes _____	No____
d.	RCC	Yes _____	No____
e.	Commercial Bank	Yes _____	No____
f.	Other	Yes _____	No____

35. Have you ever defaulted (that is not repaid) on a loan? (INTERVIEWER: By defaulting we mean that loan was NEVER repaid as agreed upon by the lender)

a.	Relative	Yes _____	No____
b.	Friend	Yes _____	No____
c.	Money Lender	Yes _____	No____
d.	RCC	Yes _____	No____
e.	Commercial Bank	Yes _____	No____
f.	Other	Yes _____	No____

INTERVIEWER: *Now I would like to ask you some questions about the borrowing environment. For these questions please respond to one of the following Strongly Agree, Moderatly Agree, Agree, Disagree, Strongly Disagree.* (Interviewer after reading each question repeat the list starting with Strongly agree)

36. Money lenders are more flexible in repayment terms than RCC.
    Strongly Agree____ Moderately Agree_____ Agree_____ Disagree_____ Strongly Disagree ____

37. Relatives are more flexible in repayment terms than RCC.
    Strongly Agree____ Moderately Agree_____ Agree_____ Disagree_____ Strongly Disagree ____

38. Friends are more flexible in repayment terms than RCC.
    Strongly Agree____ Moderately Agree_____ Agree_____ Disagree_____ Strongly Disagree ____

39. Borrowing from relatives or friends causes them hardship.
    Strongly Agree____ Moderately Agree_____ Agree_____ Disagree_____ Strongly Disagree ____

40. I would be willing to pay more than the RCC interest rate in order to obtain a loan.
    Strongly Agree____ Moderately Agree_____ Agree_____ Disagree_____ Strongly Disagree ____

41. Recalling the last time you borrowed money. What was it for ?.(INTERVIEWER read the following list)
    a. Health/medicine _____
    b. Wedding _____
    c. Funeral _____
    d. School tuition _____
    e. Production agriculture (fertilizer, seed, hired labour etc) _____
    f. Machinery and equipment _____

g. House construction. _____
h. Household consumption _____
i. Holiday/vacation _____
j. Other (Interviewer to write down item)_____

INTERVIEWER: *Thank you for your patience. I have just a few more questions on TRUST that I would like to ask you. For these questions please respond to one of the following Strongly Agree, Moderately Agree, Agree, Disagree, Strongly Disagree.*
(Interviewer after reading each question repeat the list starting with strongly agree)

42. If you make a loan to a family member or relative, you TRUST the family member/relative to pay it back within a reasonable period of time

Strongly Agree (5)____ Moderately Agree(4)_____ Agree(3)_____ Disagree(2)_____ Strongly Disagree(1) ____

43. If you make a loan to a friend, you TRUST the friend to pay it back within a reasonable period of time.

Strongly Agree____ Moderately Agree_____ Agree_____ Disagree_____ Strongly Disagree ____

44. If a family member or relative makes a loan to you the family member does so because the family member/relative TRUSTS that you will pay it back in a reasonable period of time.

Strongly Agree____ Moderately Agree_____ Agree_____ Disagree_____ Strongly Disagree ____

45. If a friend makes a loan to you the friend does so because the friend TRUSTS that you will pay it back in a reasonable period of time.

Strongly Agree____ Moderately Agree_____ Agree_____ Disagree_____ Strongly Disagree ____

46. In your community informal lending between friends and relatives occurs because you TRUST one another.

Strongly Agree____ Moderately Agree_____ Agree_____ Disagree_____ Strongly

Disagree ____

47. If you had money available you would lend to a friend or a relative even though you **MAY NOT** TRUST them to repay the loan.
Strongly Agree____ Moderately Agree_____ Agree_____ Disagree_____ Strongly Disagree ____

48. If you needed a loan from a Rural Credit Cooperative but do not have the collateral to support the loan, the RCC will lend to you anyway because the RCC TRUSTS you to pay it back.
Strongly Agree____ Moderately Agree_____ Agree_____ Disagree_____ Strongly Disagree ____

49. If you needed a loan from a bank but do not have the collateral to support the loan, the bank will lend to you anyway because the bank TRUSTS you to pay it back.
Strongly Agree____ Moderately Agree_____ Agree_____ Disagree_____ Strongly Disagree ____

50. If you needed a loan from a Money Lender but do not have the collateral to support the loan, the Money Lender will lend to you anyway because the Money Lender TRUSTS you to pay it back.
Strongly Agree____ Moderately Agree_____ Agree_____ Disagree_____ Strongly Disagree ____

51. INTERVIEWER: *This is the last question. It is a hypothetical situation. Suppose that you owed 1,000 RMB to each of a RCC, commercial bank, Money lender, friend, relative for a total indebtedness of 5,000 RMB. Now suppose that you had available $1,000 RMB to repay the loans. Which of the following is most likely to occur* (select only 1)?
    a. You would pay back a family member or relative before anyone else
    b. You would pay back a friend before anyone else
    c. You would pay back the RCC before anyone else
    d. You would pay back the commercial bank before anyone else

e. You would pay back the money lender before anyone else.

f. You would pay some money to all of the lenders

Guilt questions:

52. a. Have you ever defaulted on a loan from a family member? __ Yes ___ No
b. If yes, how guilty did you feel? Not guilty 1 2 3 4 5 6 7 8 Very guilty
c. If no, how much guilt would you have felt if you had defaulted?
Not guilty 1 2 3 4 5 6 7 8 Very guilty

53. a. Have you ever defaulted on a loan from a neighbor? ____ Yes ____ No
b. If yes, how guilty did you feel? Not guilty 1 2 3 4 5 6 7 8 Very guilty
c. If no, how much guilt would you have felt if you had defaulted?
Not guilty 1 2 3 4 5 6 7 8 Very guilty

54. a. Have you ever defaulted on a loan from an RCC? ____ Yes ____ No
b. If yes, how guilty did you feel? Not guilty 1 2 3 4 5 6 7 8 Very guilty
c. If no, how much guilt would you have felt if you had defaulted?
Not guilty 1 2 3 4 5 6 7 8 Very guilty

55. a. Have you ever defaulted on a loan from another financial institution?
__Yes __ No
b. If yes, how guilty did you feel? Not guilty 1 2 3 4 5 6 7 8 Very guilty
c. If no, how much guilt would you have felt if you had defaulted?
Not guilty 1 2 3 4 5 6 7 8 Very guilty

56. a. Have you ever defaulted on a loan from a moneylender? __ Yes ____ No
b. If yes, how guilty did you feel? Not guilty 1 2 3 4 5 6 7 8 Very guilty
c. If no, how much guilt would you have felt if you had defaulted?
Not guilty 1 2 3 4 5 6 7 8 Very guilty

57. What proportion of Household income are you able to save in a year (in RMB):

a) None b) Less than 5% c) Between 5 and 10% d) More than 10%

58. If there is a significant reduction in uncertainty in your income would you be more likely to (select only 1)

a) Decrease savings and increase investment in agricultural production

b) Decrease savings and increase purchases of household consumer goods

c) Decrease savings and increase travel/vacation

d) Maintain the same amount of savings

e) Increase savings slightly

f) Increase savings a lot

59. I am able to borrow needed amount of money from Banks or RCC for **consumption, education and health** purposes?

Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

60. I am able to borrow needed amount of money from Banks or RCC for **farming** and business purposes?

Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

61. When I am not able to borrow needed amount of money from Banks and RCC for **consumption, education and health** purposes, I find it convenient to borrow from

(i) Moneylender____
(ii) Friends _____
(iii) Relatives _____.

62. When I am not able to borrow needed amount of money from Banks and RCC for **farming and business** purposes, I find it convenient to borrow from

(i) Moneylender____
(ii) Friends _____
(iii) Relatives _____.

63. Do you have any apprehension of obtaining a loan from a Bank or Rural Cooperative – if so indicate the reasons as following?

(a) I have unpaid debts on previous RCC or bank loans.

Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

(b) Interest rates on RCC or bank loans are higher than interest rates on loans from friends or relatives.

Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

(c) Interest rates on RCC or bank loans are higher than I am able to pay.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

(d) I lack the collateral to get a loan .
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

(e) The RCC or bank is too far for me to travel.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

(f) RCC or bank requires too much paper work.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

(g) RCC or bank takes too long in approving loan.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

(h) RCC or bank lender requires a bribe.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

(i) I would prefer to borrow from a friend or relative.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

(j) I would prefer to borrow from a money lender.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

(k) I do not like to be indebted to a bank or RCC.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

64. If interest rates on RCC or bank loans were lower than current interest rates I would be more likely to borrow from a bank or RCC.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

65. If the cost of obtaining a loan (fees, non-interest charges) on RCC or bank loans were lower than current costs I would be more likely to borrow from a bank or RCC.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

66. Whether or not you have ever defaulted on a loan from a RCC, Bank, Friend or a Relative, which of the following circumstances would most likely be the cause of a default in the past or future.

a. Lack of resources.

Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

b. Terms of contract not clear.

Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

c. Suffered crop loss, cattle loss.

Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

d. Suffered death or major sickness of a family member

Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

e. I diverted the loan for other purpose.

Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

f. Other reasons.

Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

Credit Rationing Model

67. If I had more land (assets), then I could get a higher loan from a bank or RCC ***without using the assets for collateral.***

Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

68. If I had more land (assets), then I could get a higher loan from a RCC or bank but ***only if I use the assets as collateral***.

Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

69. If I had more land (assets), then I could get a higher loan from RCC or bank, *at a lower interest rate*, ***without using the assets as collateral***.

Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

70. If I had more land (assets), then I could get a higher loan from RCC or bank, *at a lower interest rate*, ***but only if I use the assets as collateral***.

Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree

____

71. I believe that honest borrowers are compelled to pay higher interest rate, because some borrowers do not repay their loan?
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

72. I believe that honest borrowers are not able to obtain a required amount of loan, because some of the villagers do not repay their loan or divert the loan.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

73. To obtain a required amount of loan, I would be willing to pay a higher interest rate.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

74. To obtain a required amount of loan, I would be willing to post more collateral.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

75. I believe that a borrower who accepts a loan that is very high relative to his farm assets is more likely to VOLUNTARILY default on that loan.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

76. I believe that a borrower who accepts a loan, at a higher interest rate is more likely to VOLUNTARILY default on that loan.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

Credit Rationing Impact

Please answer the following questions. Interviewer here we use the term 'borrowing constraint'. By borrowing constraint we mean that the farmer cannot obtain all of the funds requested from an RCC or bank in the amounts or time frame required.

77. If I faced a borrowing constraint I would use less input than is required for maximizing farm income.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

78. If I faced a borrowing constraint I would need wages from off-farm employment.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

79. If I faced a borrowing constraint I would not be able to provide a strong education and adequate health care for my children.

Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

80. If I faced a borrowing constraint my family members (including me) would not be able to get adequate food throughout the year.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

81. If I could get adequate credit from a bank or RCC I would
a) leave agriculture and start a non-farm enterprise _____.
b) Remain in agriculture and expand agricultural production _____
c) Remain in agriculture AND start a non farm business _____

Informal Lending among Friends and Relatives

82. Have you ever received a money gift from a **friend** that you did not have to repay Yes____ No_____.

83. Have you ever received a money gift from a **relative** that you did not have to repay. Yes____ No_____.

84. Have you ever given a money gift to a **friend** that he or she did not have to repay. Yes____ No_____.

85. Have you ever given a money gift to a **relative** that he or she did not have to repay. Yes____ No_____.

86. Have you **ever** borrowed money from a **friend.** Yes____ No_____.

87. Have you **ever** lent money to a **friend.** Yes____ No_____.

88. Have you **ever** borrowed money from a **relative.** Yes____ No_____.

89. Have you **ever** lent money to a **relative .**Yes____. No_____.

90. I would lend money to a friend even if that friend had previously refused a loan to me
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

91. I would be able to borrow from a friend even if I had previously refused to lend to that friend
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

92. I would lend money to a relative even if that relative had previously refused a loan to me.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

93. I would be able to borrow from a relative even if I had previously refused to lend to that relative
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

94. I am able to get a money ***gift*** from a **relative** when I face emergencies (such as crop loss, cattle loss, major sickness etc.).
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

95. I am able to get a money ***gift*** from a **friend** when I face emergencies (such as crop loss, cattle loss, major sickness etc.).
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

96. I am able to get a ***loan*** from a **relative** when I face emergencies (such as crop loss, cattle loss, major sickness etc.).
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

97. I am able to get a ***loan*** from a **friend** when I face emergencies (such as crop loss, cattle loss, major sickness etc.)
strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

98. I am willing to give a money ***gift*** to a **relative** when they face emergencies (such as crop loss, cattle loss, major sickness etc.)
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

99. I am willing to give a money ***gift*** to a **friend** when they face emergencies (such as crop loss, cattle loss, major sickness etc.)_____.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

100. I am willing to give a ***loan*** to a **relative** when they face emergencies (such as crop loss, cattle loss, major sickness etc.).
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

101. I am willing to give a ***loan*** to a **friend** when they face emergencies (such as crop loss, cattle loss, major sickness etc.)_____.

Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

102. I prefer giving loan at very low interest rate rather than a money gift to friends and relatives ***in the case of emergency***.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

103. I prefer getting a loan at very low interest rate rather than a money gift from friend and relatives ***in the case of emergency***.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

104. I would rather give a loan at a very low interest rate rather than a money gift to friends and relatives for cases ***not related to emergency***.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

105. I would rather get a loan at very low interest rate rather than a money gift from friends and relatives for cases ***not related to emergency***_____.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

106. I would prefer not to default in repayment of loans to friends and relatives.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

107. I am able to delay loan repayment to friend and relatives, when I am not able to repay because of some emergency.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

108. I allow the delay of loan repayment by friend and relatives, when they are not able to repay because of some emergency.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

109. I am able to get the reduction in the interest rate on loan repayment to friends and relatives, when I am not able to repay because of some emergency.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

110. I would reduce the interest rate on a loan to friends and relatives, when they are not able to repay because of some emergency.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

111. The more amount I lend to a friend or relative, the more likely it is that they will default on the loan.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

112. The community/village pressure helps in the repayment of loans between friends and relatives and lowers default.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

113. I am able to borrow more when my friend's and relatives' income are higher.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

114. I find it easier to borrow from friends and relatives if I have repaid loans on earlier occasions.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

115. I am more willing to lend to friends and relatives when they have repaid earlier loans to me.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

116. I am more likely to give loans to friends and relatives even at a low interest rate knowing that he may not repay fully, who have lent/ gifted/repaid money to me on earlier occasion.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

117. I am not likely to give loans to friends and relatives even if they offer to pay a higher interest rates, who have previously **refused** to lend/ gift/ repay money to me on an earlier occasions.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

118. It is unlikely that I could obtain a loan from a friend or relative, even if I offer to pay a higher interest rate, if I have previously **refused** to lend/ gift/ repay money to them on earlier occasions.
Strongly Agree ___ Moderately Agree ___ Agree ____ Disagree ____ Strongly Disagree ____

119. Risk Perceptions and Risk Motives

"Imagine an honest stranger comes up to you and offers a gamble with the payout depending on the flip of a coin. If the coin lands heads you get the amount in the first

column and if it lands tails you get the amount in the second column. Each has a 50% chance of occurring. If the gamble was repeated by many flips of the coin you would expect to receive the amount in the third column. While the odds of receiving the amount in the first column are the same as the odds in the second column the high and low values are different. Study the six gambles in the table and select the **one** gamble that you would prefer".

Choice	Gain in Good luck: (RMB): 50% chance	Gain in Bad luck: (RMB): 50% chance	Expected value (RMB)
1	500	500	500
2	950	450	700
3	1200	400	800
4	1500	300	900
5	1900	100	1000
6	2000	0	1000

APPENDIX 2

康奈尔大学/西北农林科技大学
关于亲朋之间的非正式借贷，
及农民对天气保险与健康保险兴趣的调查

调查者须知：首先感谢你们在百忙之中参与我们的调查。这项调查大约需要30分钟，再次感谢各位的参与。我们所做的这个调查是美国康奈尔大学和西北农林科技大学联合进行的。我们想了解的是你所面临的来自银行和农村信用社的信贷配给和借贷约束问题，以及你们如何通过向亲戚朋友之间非正式借款来解决这类问题。对于上述行为中存在的风险，以及你对天气保险和健康保险的兴趣，我们都很想知道。你的答案将会是保密的，而且绝对不会被辨认出来。另外有些问题你们可能也没有准确可靠的答案，如果是这样，你只需提供给我们最接近的估计数。当然，你有权拒绝回答我们提出的任何问题。

考虑到上述情况，你愿意参与我们的调查吗？ 愿意_____ 不愿意_____

如果不愿意，也没有关系。请告诉我们不愿意的理由。

调查者注意：如果上述理由是因为被调查者不知道准确的信息，我们要了解具体的原因并向他们再一次说明我们只是希望他们尽力合作，而且我们也并不需要每个被调查者都有准确的信息。然后请他们重新考虑是否要参与调查。

调查者注意：如果上述理由是因为涉及到被调查者的个人隐私，我们要告诉他们的参与对我们研究的意义，以及这些调查全都是匿名的，而且会保证他们的隐私不泄漏。然后请他们重新考虑是否要参与调查。

如果回答的是“是”，则“非常感谢你接受调查，我们开始吧。我们想先问一些一般性的问题，以了解你的家庭情况”。 转到第一问。

A．农业的特点和农民对风险的态度

0a.你的家庭户主的性别： _____男; _____女

0b.你的年龄_____

1.你所在的村名？ _____

2.你已经务农多少年了？ _____

3.你家农地的面积(1英亩= 6.07亩)？ _____

4. 请按照销售收入由高至低的顺序列出你家的五种农产品(比如 玉米, 小麦, 奶制品等) 和销售总额。

顺序	农作物	总销售额
1		
2		
3		
4		
5		

5.务农是你的主要收入来源吗？ _____ 是 _____ 否

6.在过去的一年里，各种来源的家庭总收入是多少？ _____

7. 请计算第6题中的总收入占你务农开支的比例_____

（**调查者：**标出这些数字。如果他们不知道准确地数字，就告诉他们“我们不需要准确地数字，只要一个大概的数字就可以”或“是不是多于或少于50%、少于20%等直到一个数字被认可”）

8.包括你在内, 有几口人住在家里？ _____

9.家中的孩子

a.有几个孩子上小学？ _____

b.有几个孩子上中学？ _____

c.有几个孩子上大专（大学）？ _____

9.0. 你的教育程度是：

a.从未上过学_____

b.上过小学_____

c.小学毕业_____

d.上过中学_____

e.中学毕业_____

f.上过大专或大学_____

g.大专或大学毕业_____

10.你们家里是否有人患重病？ 有_____ 没有_____

（**调查者：**“非常感谢你，现在我想问一下你对风险的态度及你目前在农业上所面临的风险”）

B.风险的来源和风险观念

11.请说明一下，你是否愿意承受风险（选一个最合适的答案）

风险描述	不愿意	较不愿意	无所谓	较愿意	愿意
我愿意承受较大的生产风险以增加获得较高收入的机会	1	2	3	4	5
在看到其他农户有好的收益之前，我愿意承受采用新技术的风险。	1	2	3	4	5
在看到其他农户有好的收益之前，我愿意承受采用新的管理方法的风险	1	2	3	4	5

12.对问题4所列举的各种作物，确定一个你认为可能出现的最低价格、最可能的价格以及在明年（2008年）很有可能出现的最高价格。

（**调查者：**回到问题四中，对被调查者所列举的每一种农作物估计一个可能的最低和最高价。你可能要告诉他们“我们不需要准确的数字，只写出你自己对这些价格的估计就可以。”通过这些可能的价格，了解他们对明年农作物的可接受价格的期望是多少。注：最可能的价格可以和可能的最低和最高价格相同）。

农作物	可能的最低价格	最可能的价格	可能的最高价格
1			
2			
3			
4			
5			

13.

对问题4所列举的各种作物，确定一个你认为可能的最低产量、最可能的产量以及在明年（2008年）可能的最高产量。（**调查者：**读出问题4后的农作物并请被调查者估计每个农作物所对应的最低产量、最可能的产量及最高产量，应说明“我们不需要准确的数字，只写出你对这些产量的估计就可以。”通过这些可能的产量，了解他们对明年农作物的可接受产量的期望是多少。注：最可能的产量可以和可能的最低和最高产量相同）。

农作物	最低产量	最可能的产量	最高产量
1			
2			
3			
4			
5			

14.以下的天气事件在种植、生长和收获期间可能导致你的产量低于预期的产量。请估计这些事件的重要性并由低到高的顺序排列，用1至5表示。1表示不重要，2表示不是很重要，3表示影响不大，4表示重要，5表示非常重要。（圈出最合适的答案）

（**调查者：**向被调查者读出每个月，说明每个月的天气情况及其对收入的影响。先回答雨水不足再回答雨水过量对收入的影响情况）

	雨水不足 (低于需要的)					雨水过多 (高于需要的)				
月份	不重要	较不重要	没影响	较重要	非常重要	不重要	较不重要	没影响	较重要	非常重要
一月	1	2	3	4	5	1	2	3	4	5
二月	1	2	3	4	5	1	2	3	4	5
三月	1	2	3	4	5	1	2	3	4	5
四月	1	2	3	4	5	1	2	3	4	5
五月	1	2	3	4	5	1	2	3	4	5
六月	1	2	3	4	5	1	2	3	4	5
七月	1	2	3	4	5	1	2	3	4	5
八月	1	2	3	4	5	1	2	3	4	5
九月	1	2	3	4	5	1	2	3	4	5
十月	1	2	3	4	5	1	2	3	4	5
十一月	1	2	3	4	5	1	2	3	4	5
十二月	1	2	3	4	5	1	2	3	4	5

15.

以下的天气事件在种植、生长和收获期间可能导致你的收益低于预期的收益。请估计这些事件的重要性并按照由低到高的顺序排列，用1至5表示。1表示不重要，2表示不是很重要，3表示影响不大，4表示重要，5表示非常重要。（圈出最合适的答案）

（**调查者：**向被调查者读出每个月并标出不重要的，先回答天气太热再回答天气太冷对收入的影响情况）

	天气过热 (气温高于需要的温度)					天气过冷 (气温低于需要的温度)				
月份	不重要	不太重要	没影响	较重要	非常重要	不重要	不太重要	没影响	较重要	非常重要
一月	1	2	3	4	5	1	2	3	4	5
二月	1	2	3	4	5	1	2	3	4	5
三月	1	2	3	4	5	1	2	3	4	5
四月	1	2	3	4	5	1	2	3	4	5
五月	1	2	3	4	5	1	2	3	4	5
六月	1	2	3	4	5	1	2	3	4	5
七月	1	2	3	4	5	1	2	3	4	5
八月	1	2	3	4	5	1	2	3	4	5
九月	1	2	3	4	5	1	2	3	4	5
十月	1	2	3	4	5	1	2	3	4	5
十一月	1	2	3	4	5	1	2	3	4	5
十二月	1	2	3	4	5	1	2	3	4	5

调查者：“非常感谢你的参与，它对我们的研究很有帮助。现在我们想了解一下你如何应对这些风险。”

C.风险管理措施的使用和理解

16.请你指出以下的各个项目在你的农业风险管理中的重要程度，如果不采用这个风险管理措施请用“x”表示。1表示不重要，
2表示不是很重要，3没影响，4表示重要，5表示非常重要。（圈出最合适的答案）

风险管理措施	不采用	不重要	较不重要	没影响	较重要	非常重要
种养多于一种植物、动物（经营多样化）		1	2	3	4	5
农田或农场在不同的地点(地域多样化)		1	2	3	4	5
灌溉		1	2	3	4	5
分散销售：各个时间都销售产品而不是一次性售出所有产品 (市场多样化)		1	2	3	4	5
采用合同以固定的价格预售农作物		1	2	3	4	5
参与政府项目		1	2	3	4	5
维持金融储备:拥有现金及可变现资产(如机械，牲畜)		1	2	3	4	5
投资非农产业作为收入的其他来源		1	2	3	4	5

D.作物保险的使用和理解

调查者：农作物保险是西方农民常用的一种工具。如果你的作物产量低于平均产量一定的百分比，农作物保险将补偿你的损失。例如，你某个农作物的产量为1000公斤/亩，当你的农作物实际产量低于这个水平的70%时，农业保险将给你提供补偿。举例来说，如果你的实际产量为500公斤，你会获得赔偿等于700公斤与500公斤的差量（200公斤）乘以该农作物的平均价格。如果价格为5元，则你就会获得5*（700-500）=1000元的补偿，但如果你的产量高于700公斤，就不会得到任何补偿。

17.如果中国推出农作物保险，你将会购买吗？

_____定期 _____ 偶尔 _____某些年 _____ 不会

18.考虑农户的所有方面，包括农田、农作物经营、房子、财物、汽车、机械和设备，你会定期为下列项目购买保险吗？

a.人寿保险 是_____ 否____

b.房屋和财物火险 是_____ 否____

c.汽车保险 是_____ 否____

d.健康/医疗保险 是_____ 否____

e.保护农作物免受损失（农作物保险） 是_____ 否____

f.保护牲畜免受损失（牲畜保险） 是_____ 否____

g.其他_____

E.新型天气保险产品

调查者：“我们将要评价在农业中可能应用到的一些和雨水不足或过量、天气过热或过冷有关的新型保险。例如，你买了雨水不足的保险，如果在一个月或一个季节你农场的降雨量低于你需要的降雨量，你就会获得一笔赔偿。这笔赔偿金只是以缺水量的多少为计算基础，而不考虑你的产量降低了多少。只有通过当地气象站或农场自己的气象站测量过历史降雨量，你的保险合同才能签订”。

19.，如果市场上存在一些定价合理的风险管理工具，这些工具在以下天气事件发生时会提供一定数额的赔偿，请你估计你对这类风险管理工具的感兴趣程度。使用1到5共5个等级，1：没兴趣，2：有一点兴趣，3：有兴趣，4：有较高兴趣，5：非常有兴趣。（圈出最合适的答案）

天气事件	没兴趣				非常感兴趣
在关键时间降雨量过多	1	2	3	4	5
在关键时间过热	1	2	3	4	5
在一段时期降雨过少	1	2	3	4	5
在一段时期过冷	1	2	3	4	5
大风	1	2	3	4	5
其他 (请列出_____)	1	2	3	4	5

19. 请标出天气保险在耕种过程中各个阶段的重要性。使用1到5共5个等级，1：不重要，2：不太重要，3：影响不大，4：重要，5：非常重要。（圈出最合适的答案）

耕种阶段	不重要		没影响		很重要
种植阶段	1	2	3	4	5
生长阶段	1	2	3	4	5
收获阶段	1	2	3	4	5

21.你通常会从哪里得到气温和降水的信息？

a）我不收天气预报_____

b）当地气象站_____

c）农户自己的气象站_____

d）电视_____

e）收音机_____

f）其他来源（请列出_____）

22.据你所知，请估计一下本地区或政府的气象站距离你的农地有多远？

g）公里_____

h）如果你不知道距离，请用村庄或地区来形容_____

i）不知道_____

23.据你所知，最近的气象站所报的降雨量和气温（在整个夏季）与你家农地的实际降雨量和气温是否一致？

____非常接近 ____ 较接近 ____ 有点接近 ____ 根本不符 ____ 不知道

F. 农户融资及风险管理

24.你有尚未偿还的债务吗？有 ____ 没有 ____

25.如果有，说明你欠款的总额，包括你向朋友、亲戚、放款人、农村信用社和商业银行的借款。

_____

26.如果有欠款，请说明您上年的欠款占总资产的比例。

____ 0-20% ____ 21-25% ____ 26-30% ____ 31-35% ____36-40% ____41-45%

____ 46-50% ____ 51-60% ____ 61-70% ____ 超过70% _____ 不知道

27.如果把你家所有的资产（包括房屋，土地，家畜，农产品等）卖掉，你认为能获得多少收入？_____

调查者：“这个问题涉及到资产价值，可能比较难回答。如果被调查者不知道或不理解，就回答不清楚”。

28. 如果有尚未偿还的欠款，你能否提供下列欠款占总债务的大概比例？

a）欠亲戚 _____

b）欠朋友_____

c）欠放款人_____

d）欠农村信用合作社_____

e）欠银行_____

f）欠其他_____

（调查者：计算出从a到e的总和是否为100，如果不是100，就将他们的和与100的差额计入“其他”。如果你不能获得百分数则向被调查者咨询一个确切的人民币金额。）

29. 权衡你目前的债务总额、收入总额和生产能力，你认为你的债务处于何种水平？

___很少，_____较少，_____不多不少，_____较多，_____很多

30.调查者：“这些将很有帮助。现在我们想了解一下关于你近期主要贷款的利率。对每种借款类型，请你填写它的实际利率。如果你现在没有这种借款，就填写你认为可能被收取的利率。这些利率可能是你从朋友、亲戚或其他可靠途径听来的”。（调查者：对每一种情况都要说明“实际的利率”“认为的利率”“不知道”）

a）亲戚　　实际_____　认为_____　不知道_____

b）朋友　　实际_____　认为_____　不知道_____

c）放贷者　　实际_____　认为_____　不知道_____

d）农村信用合作社 实际_____　认为_____　不知道_____

e）银行　　实际_____　认为_____　不知道_____

f）其他　　实际_____　认为_____　不知道_____

31. 农村信用社或银行曾经拒绝给你贷款吗？有_____　没有_____

32. 如果有，他们拒绝给你贷款的主要原因是什么（如有必要可以选择多个答案）？

a）抵押不足_____

b）农作物/牲畜的价格风险过大_____

c）产量风险过大_____

d）种植的农作物受恶劣天气影响较大_____

e）过去有未还清的债务_____

f）银行不信任我_____

g）银行不相信我能获得足够的收入_____

h）农村信用合作社所要求的还款计划与我产品销售时间不匹配_____

33.你能够从银行或农村信用社获取你所需要的贷款额度吗？

a）从不 _____

b）有时 _____

如果有，那么你得到的贷款数额与你实际要求的贷款数相一致的比例大概是多少_____

c）总是_____

34.你推迟过偿还贷款吗？（调查者：“推迟”的意思是指还款不及时，但却最终偿还了的。）

a）亲戚 是_____ 否_____

b）朋友 是_____ 否_____

c）放贷者 是_____ 否_____

d）农村合作信用社 是_____ 否_____

e）商业银行 是_____ 否_____

f）其他 是_____ 否_____

35.你在偿还贷款上违约过吗（即未偿还）？（调查者：我们所说的“违约”是指你的借款从未偿还）

a）亲戚 是_____ 否_____

b）朋友 是_____ 否_____

c）放贷者 是_____ 否_____

d）农村合作信用社 是_____ 否_____

e）商业银行 是_____ 否_____

f）其他 是_____ 否_____

调查者：“现在我们想要了解一下借款环境。回答这些问题从“非常同意，一般同意，同意，反对，强烈反对”五个选项中选择”。（调查者读完每个问题后按这个顺序读选项）

36.在贷款偿还方面，放款者要比农村信用合作社更加通融（灵活）一点

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

37. 在贷款偿还方面，亲戚要比农村信用合作社更加通融（灵活）一点

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

38. 在贷款偿还方面，朋友要比农村信用合作社更加通融（灵活）一点

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

39. 从亲戚或者朋友那儿借钱会给他们带来经济困难

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

40. 你愿意支付比农村合作信用社更高的利率以获得贷款

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

41.上一次你借钱是为了什么？（调查者：读出下列选项）

a）健康/医疗_____

b）结婚_____

c）葬礼_____

d）学费_____

e）农业生产（肥料、种子、雇工等等）_____

f）机械和设备_____

g）修建房屋_____

h）家庭消费_____

i）旅游度假_____

j）其他（调查者记录所列举的项目）_____

调查者：“谢谢你耐心的接受调查。我们还想了解关于信用方面的情况。回答这些问题从“非常同意，一般同意，同意，反对，强烈反对”五个选项中选择”。（调查者读完每个问题后按这个顺序读选项）

42.如果你借钱给你的家人或者亲戚，你信任他们会在一个合理的时期内偿还

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意___

43.如果你借钱给朋友，是因为你信任他们会在合理的期限内偿还

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

44.你的家人或亲戚借钱给你，是因为他们信任你会在合理的期限内偿还

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

45.你的一个朋友借钱给你，是因为他信任你会在合理的期限内偿还

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

46.你所在的社区中，朋友和亲戚发生借贷关系是因为双方互相信任

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

47.如果你有多余的钱，即使你不信任亲戚或朋友会归还给你，你也会借给他们

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

48.

如果你需要从农村信用社贷款，尽管没有抵押担保，信用社也会给你放贷，因为它信任你会还款

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

49. 如果你需要从银行借钱但是你却没有抵押物，银行会因为信任你一定会归还而借钱给你

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

50. 如果你需要向放款人借钱但却没有抵押物，放款人会因为信任你一定会归还而借钱给你

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

51.**调查者：**“该问题需要一个假设条件，假如你分别欠农村信用合作社、商业银行、放款人、朋友和亲戚各1000元钱，合计5000元，而现在你只有1000元钱可用于偿还贷款，下列各个选项中你将选择哪个？”（只能选择一个）

a）你会先偿还家人或者亲戚的钱

b）你会先偿还朋友的钱

c）你会先偿还农村信用合作社的钱

d）你会先偿还商业银行的钱

e）你会先偿还放款人的钱

f）你会付给每方一部分钱

E. 内疚问题

52.a.你是否曾经没有偿还过亲戚的借款？ □是 □否

b.如果是，你感到有多内疚？ 不内疚 1 2 3 4 5 6 7 8 非常内疚

c.如果否，如果你没有偿还，你感觉会有多内疚？ 不内疚 1 2 3 4 5 6 7 8 非常内疚

53. a.你是否曾经没有偿还过邻居的借款？ □是 □否

b.如果是，你感到有多内疚？ 不内疚 1 2 3 4 5 6 7 8 非常内疚

c.如果否，如果你没有偿还，你感觉会有多内疚？ 不内疚 1 2 3 4 5 6 7 8 非常内疚

54.a.你是否曾经没有偿还过农村合作信用社的贷款？ □是 □否

b.如果是，你感到有多内疚？ 不内疚 1 2 3 4 5 6 7 8 非常内疚

c.如果否，如果你没有偿还，你感觉会有多内疚？ 不内疚 1 2 3 4 5 6 7 8 非常内疚

55.a.你是否曾经没有偿还过其他金融机构的贷款？ □是 □否

b.如果是，你感到有多内疚？ 不内疚 1 2 3 4 5 6 7 8 非常内疚

c.如果否，如果你没有偿还，你感觉会有多内疚？ 不内疚 1 2 3 4 5 6 7 8 非常内疚

56.你是否曾经没有偿还过放贷者的贷款？ □是 □否

如果是，你感到有多内疚？ 不内疚 1 2 3 4 5 6 7 8 非常内疚

如果否，如果你没有偿还，你感觉会有多内疚？ 不内疚 1 2 3 4 5 6 7 8 非常内疚

57.一年中用于储蓄的收入占家庭总收入的比例是多少（人民币）：

a) 没有 b) 不到 5% c) 在5%和10%之间 d) 超过10%

58.如果你的收入稳定性得到了很大提高，你最可能做什么（只选一个）：

a) 减少储蓄并在农业生产方面增加投资

b) 减少储蓄同时增加家庭消费品的购买

c) 减少储蓄并增加旅游/度假

d) 维持相同数量的储蓄

e) 稍微增加储蓄

f) 大量增加储蓄

59. 我是否能够从银行或农村信用社借到我所需要的钱来用于消费、教育支出或医疗保健？

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

60. 我是否能够从银行或农村信用社借到我所需要的钱来用于务农或经商？

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

61.

当为了消费、教育、保健，我不能从银行或农村信用社借到我所需要的钱时，我可以更方便从哪里借到这笔钱？

(i) 放款者____

(ii) 朋友 _____

(iii) 亲戚_____.

62.当为了务农或经商，我不能从银行或农村信用社借到我所需要的钱时，我可以更方便从

哪里借到这笔钱？

(i) 放款者____

(ii) 朋友 _____

(iii) 亲戚_____.

63. 你对从银行或信用社获得一笔贷款有顾虑吗？如果有，是以下哪种其原因？

(a) 我还没有偿还先前从银行或信用社所借的贷款

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

(b) 从银行或信用社贷款的利率高于从亲戚、朋友贷款的利率

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

(c) 从银行或信用社贷款的利率高于我所能负担的利率

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

(d) 我缺少获得贷款的抵押品

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

(e) 银行或信用社太远了而不能到达

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

(f) 银行或信用社贷款需要填写太多的申请文件

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

(g) 银行或信用社批准贷款的时间太长了

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

(h) 银行贷款负责人或农村信用社贷款负责人要收受贿赂

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

(i) 我更愿意从亲戚或朋友那借钱

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

(j) 我更愿意从放款者那借钱

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

(k) 我不愿意欠银行或信用社的钱

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

64.如果银行或农村信用社的利率能够比现行的利率低一些的话，我更愿意从银行或农村信用社借钱。

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

65.如果从银行或信用社获得贷款的成本（费用、非利率开支）能比现在更低一些的话，我

更愿意从银行或信用社借钱。

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

66.不管你曾经是否有过从银行、信用社或朋友、亲戚那借钱而没有还的行为，下面那种情况最可能是你在过去或将来欠钱不还的原因。

a.缺少现金来源

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

b.合同条款不明确

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

c.遭遇了作物损失、家畜损失

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

d.家庭成员死亡或得了重大疾病

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

e.把贷款转作了其他用途

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

f.其他原因

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

信贷配给模型

67.如果我有更多的土地（资产），那不用抵押我也能够从银行或农村信用社获得更多的贷款。

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

68.

假设我有更多的土地（资产）。如果我想从银行或农村信用社获得更多的贷款，那么我只能用这些土地（资产）作为抵押品。

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

69.

如果我有更多的土地（资产），即使我没有把这些土地作为抵押，我也能够从银行或农村信用社以更低的利率获得更多的贷款。

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

70.

如果我有更多的土地（资产），那我能够从银行或农村信用社以更低的利率获得更多的贷款，但是我需要用这些土地作为抵押品。

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

71.我相信诚实的借款者将被强迫偿还更高的利率，因为有些借款者并不偿还贷款.

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

72.我相信诚实的借款者不能够获得所需要的贷款数量，因为有些村民没有偿还他们的贷款或是更改贷款用途。

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

73.为了获得所需要的贷款数额，我愿意支付更高的利率。

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

74.为了获得所需要的贷款数额，我愿意抵押更多的资产。

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

75. 我相信，一个人如果借了高于自己总资产的贷款，这个人更容易违约。

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

76. 我相信，一个人如果以很高的利率借了贷款，这个人更容易违约。

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

信贷配给影响

请回答以下问题。调查者：这里我们使用了术语“借款约束”。关于借款约束我们是指农民在金额或者是需求时间方面农村信用社或银行并不总是能够满足他们的资金需求。

77. 如果我面临着借款约束，我将因此会减少投入，从而达不到收入最大化。

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

78. 如果我面临着借款约束我需要另外一份工作来增加收入。

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

79. 如果我面临着借款约束我将不能够为我的孩子提供良好的教育和足够的医疗保证。
非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

80.如果我面临着借款约束我的家庭成员（包括我）在一整年里将不能够得到足够的食物。
非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

81.如果我从银行或农村信用社能够得到足够的信贷我愿意
a)放弃农业并且开办一个非农企业_____.
b)继续农业并且扩展农业产品_____.
c)继续农业并且做非农生意_____.

亲戚朋友间的非正规借贷

82. 你是否曾经从你的朋友那得到一笔你不必还的资助？是____.否____.

83. 你是否曾经从你的亲戚那得到一笔你不必还的资助？是____.否____.

84. 你是否曾经送给你的朋友一笔他（她）不必还的资助？是____.否____.

85.你是否曾经送给你的亲戚一笔他（她）不必还的资助？是____.否____.

86. 你曾经从你的朋友那借过钱吗？是____.否____.

87. 你曾经借钱给你的朋友吗？是____.否____.

88. 你曾经从你的亲戚那借过钱吗？是____.否____.

89.你曾经借钱给你的亲戚吗？是____.否____.
非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意___

90. 即使我的朋友曾经拒绝借钱给我，我也愿意借钱给他.

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

91. 即使我曾经拒绝借钱给我的朋友，我也能从他那借到钱。

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

92.即使我的亲戚曾经拒绝借钱给我，我也愿意借钱给他.

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

93.即使我曾经拒绝借钱给我的亲戚，我也能从他那借到钱。

非常同意____ 比较同意_____ 同意____ 不同意_____非常不同意____

94.

当面临紧急情况时（如作物损失、家畜死亡、重大疾病等），我能够从亲戚那儿得到一笔赠款(无须偿还)。

非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

95.当面临紧急情况时（如作物损失、家畜死亡、重大疾病等），我能够从朋友那儿得到一笔赠款(无须偿还)。

非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

96.

当面临紧急情况时（如作物损失、家畜死亡、重大疾病等），我能够从亲戚那儿借到一笔钱。

非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

97.

当面临紧急情况时（如作物损失、家畜死亡、重大疾病等），我能够从朋友那儿借到一笔钱。

非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

98.

我愿意给亲戚一笔赠款(无须偿还)当他们面临紧急情况时（如作物损失、家畜死亡、重大疾病等）。

非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

99.我愿意给朋友一笔赠款(无须偿还)当他们面临紧急情况时（如作物损失、家畜死亡、重大疾病等）。

非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

100.

我愿意借给亲戚一笔钱当他们面临紧急情况时（如作物损失、家畜死亡、重大疾病等）。

非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

101.

我愿意借给朋友一笔钱当他们面临紧急情况时（如作物损失、家畜死亡、重大疾病等）。

非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

102.

在紧急情况下，我愿意以很低的利息借给朋友和亲戚一笔钱而不是给他们一笔赠款。

非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

103.

在紧急情况下，我愿意以很低的利息从朋友和亲戚那借到一笔钱而不是从他们那得到一笔赠款。

非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

104.

在非紧急情况下，我愿意以很低的利息借给朋友和亲戚一笔钱而不是赠给他们一笔钱。

非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

105.

在非紧急情况下，我更愿意以很低的利息从朋友和亲戚那借到一笔钱而不是从他们那得到一笔赠款。

非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

106. 在偿还朋友和亲戚的借款方面，我不愿意不还。

非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

107. 当由于一些紧急情况我不能偿还的时候，我能够推迟对亲戚朋友的贷款偿还期。

非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

108.当他们遇到紧急情况不能按时偿还的时候，我允许亲戚朋友推迟贷款期限。
非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

109．当由于一些紧急情况我不能偿还的时候，亲戚朋友可以为我降低利率。
非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

110. 当他们遇到紧急情况不能按时偿还的时候，我可以减少对他们借款的利率。
非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

111.我借给亲戚朋友的数量越大，他们就越可能拖欠贷款。
非常同意 ___ 比较同意 ___ 同意 ____ 不同意 ____ 非常不同意 ____

112.来自村民的舆论压力有助于亲戚朋友间的还款和减少违约
非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

113.当我的朋友和亲戚的收入更高时，我能够借到更多的钱。
非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

114.
我发现如果我偿还了以前从朋友和亲戚那儿借的钱，比较容易再从他们那借到钱。
非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

115. 当朋友和亲戚偿还了以前的借款，我更愿意再借给他们钱。
非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

116.
我很有可能以较低的利率借钱给那些曾经借给我钱/曾赠给我钱/曾偿还过我钱的朋友和亲戚，即使我知道他们可能不能全额偿还。
非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

117.
我不可能借钱给那些先前拒绝借给我钱/拒绝给过我赠款/没有还我钱的朋友和亲戚，即使他们愿意支付较高的利息。

非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

118.如果先前我曾经拒绝借给/赠送/偿还亲戚或朋友的钱，即使我支付很高的利率我也不可能从他们那得到一笔贷款。

非常同意____ 比较同意_____ 同意_____ 不同意_____ 非常不同意_____

119.

假定一个诚实的陌生人来找你并提供给你一个所得取决于抛扔硬币结果的赌博游戏。如果硬币正面落下，你将得到第一栏（好运气时）显示的金额，如果硬币背面落下，你将得到第二栏（坏运气时）显示的金额。好运气和坏运气各有50%的机会。如果这个赌博多次重复抛扔硬币后，你将预期得到第三栏显示的平均金额。从表中的六个赌博中选择一个你偏爱的赌博”。

选项	好运气时的所得 50% 的机会	坏运气时的所得 50% 的机会	预期金额
1	500	500	500
2	950	450	700
3	1200	400	800
4	1500	300	900
5	1900	100	1000
6	2000	0	1000

APPENDIX 3

କର୍ଣ୍ଣେଲ ବିଶ୍ୱବିଦ୍ୟାଳୟ / କୃଷି ଓ ଜଙ୍ଗଲ ବିଶ୍ୱବିଦ୍ୟାଳୟ

(ନିର୍ଦ୍ଦିଷ୍ଟ ରଣର ସୀମାବଦ୍ଧ ବଣ୍ଟନ, ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନଙ୍କ ମଧ୍ୟରେ ଅନୌପଚାରିକ ରଣପ୍ରଦାନ ଏବଂ ପାଣିପାଗ ବୀମାକରଣ ଓ ସ୍ୱାସ୍ଥ୍ୟ ବୀମାକରଣ ପ୍ରତି ଆଗ୍ରହର ମୂଲ୍ୟ ନିର୍ଦ୍ଧାରଣ ପାଇଁ ଗ୍ରାମବାସୀମାନଙ୍କ ସର୍ବେକ୍ଷଣ)

ବିବରଣଟି ଉତ୍ତରଦାତାମାନଙ୍କ ପାଖରେ ପଢ଼ାଯିବ: ପ୍ରଥମେ, ଆପଣମାନେ ଆମମାନଙ୍କୁ ସାକ୍ଷାତ କରିବା ପାଇଁ ସମୟ ପ୍ରଦାନ କରିଥିବାରୁ ମୁଁ ଆପଣମାନଙ୍କୁ ଧନ୍ୟବାଦ ଦେଉଅଛି। ଏହି ସର୍ବେକ୍ଷଣଟି ପ୍ରାୟତଃ ୩୦ ମିନିଟ ସମୟ ନେଇପାରେ ଓ ଆପଣ ଏଥିପାଇଁ ସମୟ ଦେବାରୁ ମୁଁ ପୁଣି ଧନ୍ୟବାଦ ଅର୍ପଣ କରୁଛି। ଏହି ସର୍ବେକ୍ଷଣଟି ଆମେରିକାର କର୍ଣ୍ଣେଲ ବିଶ୍ୱବିଦ୍ୟାଳୟ ଓ ନର୍ଥୱେଷ୍ଟ କୃଷି ଓ ଜଙ୍ଗଲ ବିଶ୍ୱବିଦ୍ୟାଳୟର ଯୁଗ୍ମସହାୟତାରେ କରାଯାଉଛି। ରଣର ସୀମାବଦ୍ଧ ବଣ୍ଟନ/ବ୍ୟାଙ୍କ ଓ ଗ୍ରାମ୍ୟ ରଣ ସମବାୟ ରଣପ୍ରଦାନରେ ଅସୁବିଧା ଓ ନିଜ ସମ୍ପର୍କୀୟ ଏବଂ ବନ୍ଧୁମାନଙ୍କୁ ଅନୌପଚାରିକ ରଣ ଦେବା ସମୟରେ ଆପଣମାନେ ଯେଉଁ ବାଧାବିଘ୍ନଗୁଡ଼ିକର ସମ୍ମୁଖୀନ ହେଉଛନ୍ତି, ସେସବୁ ବିଷୟରେ ତଥ୍ୟ ସଂଗ୍ରହ କରିବା ପାଇଁ ଆମେ ଆଗ୍ରହୀ। ଆମେ ମଧ୍ୟ ପାଣିପାଗ ଓ ସ୍ୱାସ୍ଥ୍ୟ ବୀମାକରଣରେ ଆପଣଙ୍କ ଇଚ୍ଛା ଓ ସାମର୍ଥ୍ୟ ଓ ତତ୍‌ସମ୍ବନ୍ଧୀୟ କ୍ଷତି ମଧ୍ୟରେ ଥିବା ସମ୍ପର୍କ ବିଷୟରେ ତଥ୍ୟ ଜାଣିବା ପାଇଁ ଇଚ୍ଛୁକ। ଆପଣଙ୍କର ଉତ୍ତର ପୁରାପୁରି ଗୋପନୀୟ ରହିବ ଏବଂ କୌଣସି ପରିସ୍ଥିତିରେ ପ୍ରକାଶ କରାଯିବ ନାହିଁ। ଆମେ ଜାଣିଛୁ ଯେ, ଆପଣଙ୍କ ପାଖରେ ଆମ ସମସ୍ତ ପ୍ରଶ୍ନର ସୁସ୍ପଷ୍ଟ ଉତ୍ତର ନଥାଇପାରେ, ଏଭଳି କ୍ଷେତ୍ରରେ, ଆପଣ ଆପଣଙ୍କ ହିସାବରେ ଉଚିତ୍ ମନେକରୁଥିବା ଉତ୍ତର ଦେଇପାରନ୍ତି। ଶେଷକଥା ହେଲା, ଆପଣ ଆମ ପ୍ରଶ୍ନର ଉତ୍ତର ଦେବାକୁ ମନା ମଧ୍ୟ କରିପାରନ୍ତି।

ଉପରୋକ୍ତ ଉଦ୍ଦେଶ୍ୟ ଥାଇ ଆପଣ ଏହି ସର୍ବେକ୍ଷଣରେ ଯୋଗଦେବା ପାଇଁ ଆଗ୍ରହୀ କି ? ହଁ....., ନାହିଁ.....

ଯଦି 'ନାହିଁ', ତାହାହେଲେ, ଠିକ୍ ଅଛି। ଆମର ଦସ୍ତାବିଜ୍ ପାଇଁ ଆପଣ କହିବେ କି କାହିଁକି ଆପଣ ଏଥିରେ ଭାଗନେବାକୁ ଆଗ୍ରହୀ ନୁହନ୍ତି ?

ପ୍ରଶ୍ନକର୍ତ୍ତାଙ୍କୁ ଟିପ୍ପଣୀ: ଯଦି ଉତ୍ତରଦାତା ଅନୁଭବ କରୁଛନ୍ତି, ତାଙ୍କ ପାଖରେ ତଥ୍ୟ ନାହିଁ, ସେଥିଲାଗି ନାହିଁ କରୁଛନ୍ତି, ତେବେ ଆମେ ତାଙ୍କୁ ଆହୁରି ବୁଝାଇବାକୁ ହେବ ଯେ, ଆମେ ସବୁ ଉତ୍ତରଦାତାଙ୍କ ଠାରୁ ସୁସ୍ପଷ୍ଟ ଉତ୍ତର ଆଶା କରୁନାହୁଁ। ପୁଣି ଥରେ ପଚାରନ୍ତୁ ଯେ, ଏଥର ସେମାନେ ଭାଗ ନେବେ କି ନାହିଁ।

ଯଦି ଉତ୍ତରଦାତା ଗୋପନୀୟତା ଦୃଷ୍ଟିରୁ ନାହିଁ କରୁଛନ୍ତି, ତେବେ ସେମାନଙ୍କୁ ପୁଣି ସୂଚାଇ ଦିଅନ୍ତୁ ଯେ, ସେମାନଙ୍କ ଯୋଗଦାନ ଆମ ଗବେଷଣା ପାଇଁ ଅତ୍ୟନ୍ତ ସହାୟକ ଏବଂ ସେମାନଙ୍କୁ ବେନାମୀ ରଖାଯିବା ସହିତ ସେମାନଙ୍କର ଏକାନ୍ତତା ବଜାଇ ରହିବ ବୋଲି ନିର୍ଭର ପ୍ରତିଶ୍ରୁତି ଦିଆଯାଉଛି। ତାପରେ, ସେମାନଙ୍କୁ ପଚରାଯାଉ ଯେ ଏବେ ସେମାନେ ଭାଗନେବେ କି ନାହିଁ।

ଯଦି ହଁ.....''ଆପଣଙ୍କର ସମ୍ମତି ପ୍ରଦାନ ପାଇଁ ବହୁତ ଧନ୍ୟବାଦ, ଆସ, ଏଥର ଆରମ୍ଭ କରିବା। ଆପଣଙ୍କର ଗୃହ ଓ କୃଷିକ୍ଷେତ୍ର ସମ୍ବନ୍ଧୀୟ କେତେକ ସାଧାରଣ ପ୍ରଶ୍ନରୁ ଆରମ୍ଭ କଲେ, ଠିକ୍ ହେବ।''....

ପ୍ରଶ୍ନ ୧ ରୁ ଆରମ୍ଭ କର ।

କ. କୃଷିକ୍ଷେତ୍ରରେ ବୈଶିଷ୍ଟ୍ୟ ଓ ଚାଷୀର ଦାୟିତ୍ୱବୋଧ ମାନସିକତା

୦.କ ଗୃହକର୍ତ୍ତାଙ୍କର ଲିଙ୍ଗ ; ପୁରୁଷ.....ମହିଳା.....

୦.ଖ ଆପଣଙ୍କର ବୟସ ?.....

୧. ଆପଣ କେଉଁ ଗ୍ରାମରୁ ଆସିଛନ୍ତି ?.....

୨. ଆପଣ କେତେବର୍ଷ ହେବ ଚାଷ କରିଆସୁଛନ୍ତି ?.....

୩. ଆପଣଙ୍କ ଚାଷଜମିର ପରିମାଣ (୧ ଏକର =୬.୦୭ ଏମ୍‌ୟୁ) କେତେ ?.....

୪. ସବୁଠାରୁ ଅଧିକ ମୂଲ୍ୟଦେଉଥିବା ଠାରୁ ଆରମ୍ଭ କରି ସବା ଉପରେ ପାଞ୍ଚୋଟି ଶସ୍ୟର ତାଲିକା କର ।

ଶ୍ରେଣୀ	ଶସ୍ୟ	ମୋଟ ବିକ୍ରୀ ପରିମାଣ
୧		
୨		
୩		
୪		
୫		

୫. ଆପଣଙ୍କ ଚାଷଜମି ବ'ଣ ଆପଣ ଆୟର ମୁଖ୍ୟ ପନ୍ଥା ? ହଁ .....ନାହିଁ .....

୬. ସବୁପ୍ରକାର ପନ୍ଥାରୁ ମିଶିକରି ଗତବର୍ଷ ଆପଣଙ୍କ ଘରର ଆୟ କେତେ ଥିଲା (ଯଥା ସମ୍ଭବ ଅନୁମାନ କରି) ?.....

୭. ଦୟାକରି ଅନୁମାନ କରି କୁହ ଯେ ପ୍ରଶ୍ନ ୪ରେ ଦର୍ଶାଇଥିବା ଚାଷଜମି ଆୟ ତୁମ ଆୟର କେତେ ପ୍ରତିଶତ ହେବ ? (ପ୍ରଶ୍ନକର୍ତ୍ତା: ଏହା ବହିଦିଅ। ଯଦି ସେମାନେ ସମ୍ପୂର୍ଣ୍ଣ ଠିକ୍ ଉତ୍ତର ଆଣି ନାହାନ୍ତି, ତେବେ ସେମାନଙ୍କୁ ସୂଚାଇଦିଅ ଯେ, 'ଆମେ ସମ୍ପୂର୍ଣ୍ଣ ଠିକ୍ ଉତ୍ତର ଚାହୁଁନାହୁଁ, କେବଳ ଏକ ଆନୁମାନିକ ଉତ୍ତର ଚାହୁଁ'' କିମ୍ବା ଏହା ୫୦ ପ୍ରତିଶତରୁ କମ୍ ବା ବେଶୀ, ୨୫ ପ୍ରତିଶତ କମ୍ ଇତ୍ୟାଦି ଏହିପରି ଯେକୌଣସି ଗୋଟିଏ ଉତ୍ତର ପାଇବା ପର୍ଯ୍ୟନ୍ତ ପ୍ରବର୍ତ୍ତାଅ।)

୮. ଆପଣଙ୍କୁ ମିଶାଇ ଘରେ କେତେ ଜଣ ସଦସ୍ୟ ଅଛନ୍ତି ?.....

(ପ୍ରଶ୍ନକର୍ତ୍ତା: ଉତ୍ତରଦାତା ନିଜେ, ତାଙ୍କର ପିଲାଛୁଆ, ବାପା ମାଆ ଇତ୍ୟାଦିଙ୍କ ମିଶାଇ ଘରେ ରହୁଥିବା ମୋଟ ସଦସ୍ୟ ସଂଖ୍ୟା)

୯. ଗୃହର ପିଲାମାନଙ୍କ ମଧ୍ୟରୁ

କ) କେତେଜଣ ପ୍ରାଥମିକ ବିଦ୍ୟାଳୟରେ ପଢୁଛନ୍ତି ?.....

ଖ) କେତେଜଣ ହାଇସ୍କୁଲରେ ପଢୁଛନ୍ତି ?.....

ଗ) କେତେଜଣ ମହାବିଦ୍ୟାଳୟ (ବିଶ୍ୱବିଦ୍ୟାଳୟ)ରେ ପଢୁଛନ୍ତି ?.....

୯.୦ ଆପଣଙ୍କର ସର୍ବୋଚ୍ଚ ଶିକ୍ଷାଗତ ଯୋଗ୍ୟତା:

କ) ଆଦୌ ବିଦ୍ୟାଳୟକୁ ଯାଇନାହିଁ.....

ଖ) ପ୍ରାଥମିକ ବିଦ୍ୟାଳୟକୁ ଅଧା ଯାଇଛି.....

ଗ) ପ୍ରାଥମିକ ଶିକ୍ଷା ସମାପ୍ତ କରିଛି.....

ଘ) ହାଇସ୍କୁଲକୁ ଅଧା ଯାଇଛି.....

ଙ) ହାଇସ୍କୁଲ ଶିକ୍ଷା ସମାପ୍ତ କରିଛି.....

ଚ) ମହାବିଦ୍ୟାଳୟ ବା ବିଶ୍ୱବିଦ୍ୟାଳୟ ଅଧାଯାଇଛି.....

ଛ) ମହାବିଦ୍ୟାଳୟ ବା ବିଶ୍ୱବିଦ୍ୟାଳୟ ଶିକ୍ଷା ସମାପ୍ତ କରିଛି.....

୧୦. ଆପଣଙ୍କର ଘରେ କେହି ଅତ୍ୟଧିକ ରୋଗାଗ୍ରସ୍ତ ହୋଇଛନ୍ତି କି ? ହଁ....., ନାହିଁ.....

ପ୍ରଶ୍ନକର୍ତ୍ତା ''ଆପଣଙ୍କର ସହାୟତା ପାଇଁ ବହୁତ ଧନ୍ୟବାଦ। ବର୍ତ୍ତମାନ ଦାୟିତ୍ୱବୋଧ ସମ୍ବନ୍ଧରେ ଆପଣଙ୍କର ମାନସିକତା ଓ ଚାଷରେ ଆପଣ ସମ୍ମୁଖୀନ ହେଉଥିବା କ୍ଷତ ବିଷୟ କିଛି ପ୍ରଶ୍ନ ପଚାରିବାକୁ ଚାହେଁ।''

ଖ) ଦାୟିତ୍ୱର ଉତ୍ସ ଓ ଦାୟିତ୍ୱପ୍ରତି ଦୃଷ୍ଟିକୋଣ

୧୧. ଦୟାକରି ଦର୍ଶାଅ ଯେ, ଆପଣ ଦାୟିତ୍ୱ ନେବା ପାଇଁ ଇଚ୍ଛୁକ ଅଥବା ଇଚ୍ଛୁକ ନୁହଁନ୍ତି; (ସବୁଠାରୁ ଅଧିକ ପ୍ରଯୁଯ୍ୟ ଉତ୍ତରଟିକୁ ଗୋଲେଇ ଦ୍ୱାରା ଚିହ୍ନିତ କର)

ବକ୍ତବ୍ୟ	ଦାୟିତ୍ୱନେବା ପାଇଁ ଇଚ୍ଛୁକ ନୁହଁନ୍ତି		ଦାୟିତ୍ୱ ନେବାରେ ଆପତ୍ତି ନାହିଁ		ଦାୟିତ୍ୱ ନେବାପାଇଁ ଇଚ୍ଛୁକ
ଅଧିକ ଲାଭର ସୁଯୋଗ ବଢ଼ାଇବା ପାଇଁ ବୃହତ ଉତ୍ପାଦନ ଦାୟିତ୍ୱ ନେବାକୁ ମୁଁ ଇଚ୍ଛୁକ	୧	୨	୩	୪	୫
ଅନ୍ୟ କୃଷିକ୍ଷେତ୍ରରେ ନୂଆ ଯାନ୍ତ୍ରିକ ବିଦ୍ୟାର ବିନିଯୋଗର ସୁଫଳ ନଜାଣି ନିଜ କ୍ଷେତ୍ରରେ ବ୍ୟବହାର କରିବାର ଦାୟିତ୍ୱ ନେବା ପାଇଁ ମୁଁ ଆଗ୍ରହୀ	୧	୨	୩	୪	୫
ଅନ୍ୟ କୃଷିକ୍ଷେତ୍ରରେ ନୂଆ ପରିଚାଳନା ପଦ୍ଧତି ବିନିଯୋଗର ବ୍ୟବହାର କରିବାର ଦାୟିତ୍ୱ ନେବା ପାଇଁ ମୁଁ ଆଗ୍ରହ	୧	୨	୩	୪	୫

୧୨. ପ୍ରଶ୍ନ ୪ ଦର୍ଶାଇଥିବା ପ୍ରତ୍ୟେକ ଶସ୍ୟର ତୁମେ ଭାବୁଥିବା ସର୍ବନିମ୍ନ ମୂଲ୍ୟ, ତୁମେ ପ୍ରାୟ ଯାହା ପାଇବା ପାଇଁ ଆଶା କରିଥିବା ମୂଲ୍ୟ ଓ ଆସନ୍ତୁ ଶସ୍ୟବର୍ଷ (୨୦୦୮)ରେ ଆଶାକରୁଥିବା ସର୍ବୋଚ୍ଚ ମୂଲ୍ୟଗୁଡ଼ିକୁ ଉଲ୍ଲେଖ କର। (ପ୍ରଶ୍ନକର୍ତ୍ତା: ପ୍ରଶ୍ନ ୪ରେ ଥିବା ଶସ୍ୟଗୁଡ଼ିକ ପଢ଼ ଏବଂ ପ୍ରତ୍ୟେକର ସର୍ବନିମ୍ନ, ଆଶାକରାଯାଉଥିବା ମୂଲ୍ୟ ଓ ସର୍ବୋଚ୍ଚ

ମୂଲ୍ୟ ଉତ୍ତରଦାତା କହିବା ପାଇଁ କୁହ। ତୁମେ ପୁଣି କୁହ 'ଆମେ ଆପଣଙ୍କଠାରୁ ସମ୍ପୂର୍ଣ୍ଣ ସଠିକ୍ ଉତ୍ତର ଚାହୁଁନାହୁଁ, ଆପଣଙ୍କର ନିଜ ହିସାବରେ ଯେଉଁ ମୂଲ୍ୟ ଠିକ୍ ବୋଲି ଭାବୁଛନ୍ତି' ମୁଖ୍ୟତଃ ଆସନ୍ତା ଉତ୍ପାଦନରେ ଆପଣ ଆଶା କରୁଥିବା ମୂଲ୍ୟ। ଟିପ୍ପଣୀ: ଭାବୁଥିବା ମୂଲ୍ୟ ସର୍ବନିମ୍ନ ଓ ସର୍ବୋଚ୍ଚ ହୋଇପାରେ।

ଶସ୍ୟ	ସର୍ବନିମ୍ନ ସମ୍ଭବତ ମୂଲ୍ୟ	ଆଶା କରାଯାଉଥିବା ମୂଲ୍ୟ	ସର୍ବୋଚ୍ଚ ସମ୍ଭତ ମୂଲ୍ୟ
୧			
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୧୩. ପ୍ରଶ୍ନ ୪ରେ ଦର୍ଶାଇଥିବା ପ୍ରତ୍ୟେକ ଶସ୍ୟର ସର୍ବନିମ୍ନ ସମ୍ଭବତ ଉତ୍ପାଦନ, ପାଇବା ପାଇଁ ଆଶାକରୁଥିବା ସମ୍ଭବତ ଉତ୍ପାଦନ ଓ ଆସନ୍ତା ଶସ୍ୟବର୍ଷ (୨୦୦୮ରେ) ଆଶା କରୁଥିବା ସର୍ବୋଚ୍ଚ ଉତ୍ପାଦନ ଉଲ୍ଲେଖ କର। (ପ୍ରଶ୍ନକର୍ତ୍ତା: ପ୍ରଶ୍ନ ୪ରେ ଉଲ୍ଲିଖିତ ଶସ୍ୟଗୁଡ଼ିକୁ ପଢ଼ି ଓ ପ୍ରତ୍ୟେକ ଶସ୍ୟ ସର୍ବନିମ୍ନ, ଆଶାକରୁଥିବା ଓ ସର୍ବୋଚ୍ଚ ଉତ୍ପାଦନ ଉତ୍ତରଦାତାଙ୍କୁ କୁହ। ତୁମେ ପୁନ ସୂଚାଇ ଦିଅ 'ଆମେ ସମ୍ପୂର୍ଣ୍ଣ ସଠିକ୍ ଉତ୍ତର ଆବଶ୍ୟକ ରୁନାହୁଁ, ତୁମେ ନିଜ ବ୍ୟକ୍ତିଗତ ହିସାବରେ ଯାହା ଉତ୍ପାଦନ ହୋଇପାରେ, ଆସନ୍ତା ବର୍ଷରେ ଯେଉଁ ଉତ୍ପାଦନ ଆଶା କରାଯାଏ ତାହା କୁହ। ଟିପ୍ପଣୀ: ଆଶାକରୁଥିବା ଉତ୍ପାଦନ ସର୍ବନିମ୍ନ ଓ ସର୍ବୋଚ୍ଚ ହୋଇପାରେ)

ଶସ୍ୟ	ସର୍ବନିମ୍ନ ସମ୍ଭବତ ଉତ୍ପାଦନ	ଆଶା କରାଯାଉଥିବା ଉତ୍ପାଦନ	ସର୍ବୋଚ୍ଚ ସମ୍ଭତ ଉତ୍ପାଦନ
୧			
୨			
୩			
୪			
୫			

୧୪. ଗଛ ଲଗାଇବା, ବେଉସଣ ଓ ଅମଳ ସମୟରେ ପାଣିପାଗ କିପରି ଆପଣଙ୍କର ଆଶାଠାରୁ କମ୍ ଉତ୍ପାଦନକାରୀ ହୁଏ ତାହା ଦର୍ଶାଅ।

୧ ରୁ ୫ ପରିମାପକ ବ୍ୟବହାର କର; ୧-ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ନୁହେଁ, ୨-ଅଳ୍ପ ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ, ୩-ନିରପେକ୍ଷ, ୪-ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ଓ ୫-ଅତି ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ (ସବୁଠାରୁ ଅଧିକ ପ୍ରକୁର୍ଯ୍ୟ ଉତ୍ତରଟି ଗୋଲେଇ ଦ୍ୱାରା ଚିହ୍ନିତକର।)

(ପ୍ରଶ୍ନକର୍ତ୍ତା: ଉତ୍ତରଦାତାଙ୍କୁ ପ୍ରତ୍ୟେକ ମାସ ଓ ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ନୁହେଁ ଇତ୍ୟାଦି ପଢ଼ି ଶୁଣାଅ। ପ୍ରଥମେ 'ବର୍ଷାର ଅଭାବ' ଓ ପରେ 'ଅଧିକ ବର୍ଷା' ପଢ଼ି ଶୁଣାଅ।)

	ବର୍ଷାର ଅଭାବ (ଆବଶ୍ୟକତାଠାରୁ କମ୍)					ଅଧିକ ବର୍ଷା (ଆବଶ୍ୟକତାଠାରୁ ବେଶୀ)				
ମାସ	ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ନୁହେଁ				ଅତି ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ	ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ନୁହେଁ				ଅତି ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ
ଜାନୁୟାରୀ	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ଫେବ୍ରୁୟାରୀ	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ମାର୍ଚ୍ଚ	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ଅପ୍ରେଲ	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ମେ	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ଜୁନ୍	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ଜୁଲାଇ	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ଅଗଷ୍ଟ	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ସେପ୍ଟେମ୍ବର	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ଅକ୍ଟୋବର	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ନଭେମ୍ବର	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ଡିସେମ୍ବର	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫

୧୫. ଗଛ ଲଗାଇବା, ବେଉସଣ ଓ ଅମଳ ସମୟରେ ପାଣିପାଗ କିପରି ଆପଣଙ୍କର ଆଶାଠାରୁ କମ୍ ଉତ୍ପାଦନକାରୀ ହୁଏ ତାହା ଦର୍ଶାଅ ।

୧ ରୁ ୫ ପରିମାପକ ବ୍ୟବହାର କର ; ୧-ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ନୁହେଁ, ୨-ଅଳ୍ପ ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ, ୩-ନିରପେକ୍ଷ, ୪-ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ଓ ୫-ଅତି ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ (ସବୁଠାରୁ ଅଧିକ ପ୍ରତୁର୍ଯ୍ୟ ଉତ୍ତରଟି ଗୋଲେଇ ଦ୍ୱାରା ଚିହ୍ନିତକର ।)

(ପ୍ରଶ୍ନକର୍ତ୍ତା : ଉତ୍ତରଦାତାଙ୍କୁ ପ୍ରତ୍ୟେକ ମାସ ଓ ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ନୁହେଁ ଇତ୍ୟାଦି ପଢ଼ି ଶୁଣାଅ । ପ୍ରଥମେ 'ଅତ୍ୟଧିକ ଗରମ' ଓ ପରେ 'ଅଧିକ ଥଣ୍ଡା' ପାଣିପାଗ ବିଷୟ ଦର୍ଶାଅ)

	ଅତ୍ୟଧିକ ଗରମ (ଆବଶ୍ୟକ ଗରମଠାରୁ ଅଧିକ)					ଥଣ୍ଡା ପାଣିପାଗ (ଆବଶ୍ୟକ ଥଣ୍ଡାଠାରୁ କମ୍)				
ମାସ	ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ନୁହେଁ				ଅତି ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ	ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ନୁହେଁ				ଅତି ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ
ଜାନୁୟାରୀ	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ଫେବ୍ରୁଆରୀ	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ମାର୍ଚ୍ଚ	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ଅପ୍ରେଲ	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ମେ	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ଜୁନ୍	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ଜୁଲାଇ	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ଅଗଷ୍ଟ	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫

ସେପ୍ଟେମ୍ବର	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ଅକ୍ଟୋବର	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ନଭେମ୍ବର	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫
ଡିସେମ୍ବର	୧	୨	୩	୪	୫	୧	୨	୩	୪	୫

ପ୍ରଶ୍ନକର୍ତ୍ତା: ଉତ୍ତରଗୁଡ଼ିକ ପାଇଁ ବହୁତ ଧନ୍ୟବାଦ। ଏଗୁଡ଼ିକ ବହୁତ ସାହାର୍ଯ୍ୟ କରିବ। ବର୍ତ୍ତମାନ ଆପଣ କିପରି ଦାୟିତ୍ୱ ତୁଲାଇଥାନ୍ତି ସେ ବିଷୟରେ ମୁଁ ପ୍ରଶ୍ନ କରିବାକୁ ଆଗ୍ରହ କରୁଛି।

ଗ. ଦାୟିତ୍ୱ ପରିଚାଳନାରେ ବିକଳ୍ପ ବ୍ୟବହାର ଓ ଦୃଷ୍ଟିକୋଣ

୧୬. ଆପଣଙ୍କ କୃଷିକ୍ଷେତ୍ରରେ ପ୍ରତ୍ୟେକ ବିଷୟ ଦାୟିତ୍ୱ ପରିଚାଳନାରେ କିପରି **ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ** ତାହା ଦୟାକରି ଦର୍ଶାଅ। ଯଦି ତମ ଦାୟିତ୍ୱ ପରିଚାଳନାରେ ଯେ କୌଣସି ବିଷୟକୁ ତୁମେ ବ୍ୟବହାର ନକର, ତବେ "X" ଦ୍ୱାରା ଚିହ୍ନିତ କର।
ପରିମାପକ: ୧ : ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ନୁହେଁ, ୨- ଅଳ୍ପଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ, ୩- ନିରପେକ୍ଷ, ୪-ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ଓ ୫-ଅତିଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ(ସବୁଠାରେ ଅଧିକ ପ୍ରଭୁଯ୍ୟ ଉତ୍ତରଟିକୁ ଗୋଲେଇ ଦ୍ୱାରା ଚିହ୍ନିତ କର।

ଦାୟିତ୍ୱ ପରିଚାଳନା ବିକଳ୍ପଗୁଡ଼ିକ	**X** , ଯଦି ବ୍ୟବହାର କରନାହିଁ	ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ନୁହେଁ				ଅତି ଗୁରୁତ୍ୱ ପୂର୍ଣ୍ଣ
ଏକାଧିକ ଶସ୍ୟ, ପଶୁ ଓ ଉଦ୍ୟୋଗ ବିବିଧୀକରଣ		୧	୨	୩	୪	୫
ଭିନ୍ନ ସ୍ଥାନରେ ଥିବା କ୍ଷେତ୍ର ବା ଚାଷଜମି (ଭୌଗଳିକ ବିବିଧୀକରଣ)		୧	୨	୩	୪	୫
ଜଳସେଚନ		୧	୨	୩	୪	୫
ବିକ୍ରୀବୃଦ୍ଧି: ଗୋଟିଏ ଜିନିଷକୁ ଏକାବେଳେ ବିକ୍ରୀ ନକରି ଅଧିକ ସମୟ ଧରି ବିକ୍ରୀ କରିବା। (ବିକ୍ରୟ ବିବିଧୀକରଣ)		୧	୨	୩	୪	୫
ଯୋଗାଯୋଗ ସ୍ଥାପନ କରି ନିଜ ଶସ୍ୟର ମୂଲ୍ୟ ଆଗୁଆ ଧାର୍ଯ୍ୟ କରିବା		୧	୨	୩	୪	୫
ସରକାରୀ କାର୍ଯ୍ୟକ୍ରମ		୧	୨	୩	୪	୫
ଆର୍ଥିକସ୍ଥିତି ବଜାୟ ରଖିବା: ପାଖରେ ନଗଦ ରାତି ବା ସହରେ ନଗଦ ରାଶିକୁ ପରିବର୍ତ୍ତନ ହୋଇପାରୁଥିବା ପରି ସମ୍ପତ୍ତି (ଉଦାହରଣ ସ୍ୱରୂପ ଯନ୍ତ୍ରପାତି, ପଶୁସମ୍ପଦ)		୧	୨	୩	୪	୫
ଅନ୍ୟ ଆହୁ ଆୟ କରିବା ପାଇଁ ଅଣକୃଷିକ୍ଷେତ୍ରରେ ନିବେଶ		୧	୨	୩	୪	୫

ଘ. ପ୍ରଶ୍ନକର୍ତ୍ତା: ଶସ୍ୟବୀମାକରଣ ପାଶ୍ଚାତ୍ୟ ଚାଷୀମାନର ଏକ ସାଧାରଣ ହତିଆର, ଯଦି ହାରାହାରି ଉତ୍ପାଦନଠାରୁ ଆପଣଙ୍କର ଉତ୍ପାଦନ କମ୍ ହୁଏ, ତେବେ ଶସ୍ୟବୀମା ଦ୍ୱାରା ସେହି କ୍ଷତି ଭରଣା କରାଯାଏ। ଉଦାହରଣ ସ୍ୱରୂପ, ଯଦି ଏକ ନିର୍ଦ୍ଦିଷ୍ଟ ଶସ୍ୟ ଏମ୍ଇଉ ପିଛା ୧୦୦୦ କି.ଗ୍ରା ଉତ୍ପାଦନ ହେବା କଥା ଓ ଏହାର ଶତକଡା ୭୦ରୁ କମ୍ ଉତ୍ପାଦନ ହେଲା ସେ କ୍ଷେତ୍ରରେ ଶସ୍ୟ ବୀମା କ୍ଷତି ପୂରଣ କରେ। ଧରାଯାଉ ଏହି ଉତ୍ପାଦନ ୫୦୦ କି.ଗ୍ରା. ହୋଇଛି, ତେବେ ଆପଣ ଅମଳ ଦରରେ ୭୦୦ କି.ଗ୍ରା ଓ ୫୦୦ କି.ଗ୍ରାର ପାର୍ଥକ୍ୟ (୨୦୦ କି.ଗ୍ରା) ଗୁଣ ମୂଲ୍ୟ ପାଇପାରିବେ। ଯଦି ଅମଳ ଦର କି.ଗ୍ରା. ପ୍ରତି ୫ ଟଙ୍କା ହୋଇଥାଏ। ତେବେ ଆପଣ ୫ (୭୦୦-୫୦୦ କି.ଗ୍ରା)=୧୦୦୦ଟଙ୍କା ପାଇଁ କ୍ଷତିପୂରଣ ପାଇବେ। କିନ୍ତୁ ଯଦି ଆପଣଙ୍କର ଶସ୍ୟ ଉତ୍ପାଦନ ଶତକଡା ୭୦ ରୁ ଅଧିକ (ଅର୍ଥାତ୍ ଏହି ଉଦାହରଣରେ ୭୦୦ କି.ଗ୍ରା)ରୁ ଅଧିକ ହୋଇଥାଏ, ଆପଣ କିଛି କ୍ଷତିପୂରଣ ପାଇବେ ନାହିଁ।

୧୭. ଯଦି ଶସ୍ୟବୀମା ଚୀନ୍‌ରେ କରାଯାଉଛି, ତେବେ ଆପଣ କ'ଣ ଏହା କରିବାକୁ ଆଗ୍ରହୀ କି ?

ନିୟମିତ ଭାବେ....., କେବେକେବେ....., କିଛି ବର୍ଷ ପାଇଁ..... ଆଦୌ ନୁହେଁ.....।

୧୮. ଘରର ସବୁକଥାକୁ ବିଚାରକରି ଆପଣ ଚାଷଜମି, ଘର, ସବୁଜିନିଷପତ୍ର, ମୋଟରଗାଡ଼ି, ଯନ୍ତ୍ରପାତି ଓ ସରଞ୍ଜାମ ଇତ୍ୟାଦିରେ ନିମ୍ନୋକ୍ତଗୁଡ଼ିକ ମଧ୍ୟରୁ କେଉଁଟି ନିୟମିତ ବୀମାକରଣ କରିଥାନ୍ତି:

କ. ଜୀବନବୀମା; ହଁ.....ନାହିଁ.....
ଖ. ଘର ଓ ସାମଗ୍ରୀର ଅଗ୍ନିବୀମା; ହଁ.....ନାହିଁ.....
ଗ. ମୋଟରଗାଡ଼ି ବୀମା; ହଁ.....ନାହିଁ.....
ଘ. ସ୍ୱାସ୍ଥ୍ୟ/ଶାରିରିକ ବୀମା; ହଁ.....ନାହିଁ.....
ଙ. ଶସ୍ୟହାନି ପ୍ରତିରୋଧକ (ଶସ୍ୟବୀମା); ହଁ.....ନାହିଁ.....
ଚ. ପଶୁସମ୍ପଦ ହାନି ପ୍ରତିରୋଧକ (ପଶୁସମ୍ପଦବୀମା); ହଁ.....ନାହିଁ.....
ଛ. ଅନ୍ୟାନ୍ୟ.....

ପାଣିପାଗ ଉପରେ ଆଧାରିତ ନୂଆ ବୀମାଗୁଡ଼ିକ

ପ୍ରସ୍ତୁଜର୍ଜି: ଅତ୍ୟଧିକ ବର୍ଷା, ନିଅଣ୍ଟିଆ ବର୍ଷା, ଅତ୍ୟଧିକ ଗରମ ବା ଥଣ୍ଡାପାଗକୁ ଅନୁଶୀଳନ କରି ନୂଆ ବୀମାଗୁଡ଼ିକ ପର୍ଯ୍ୟବେସିତ ହୋଇ ଅଛି, ଯାହାର କୃଷିକ୍ଷେତ୍ରରେ ଅନ୍ତର୍ନିହିତ ବ୍ୟବହାର ରହିଛି। ଉଦାହରଣ ସ୍ୱରୂପ ଯଦି ଆପଣ ନିଅଣ୍ଟିଆ ବୃଷ୍ଟିପାତ ବୀମା କିଣିଥାଆନ୍ତି, ତେବେ ଆପଣ ଆଶାକରୁଥିବା ବୃଷ୍ଟିପାତଠାରୁ କୌଣସି ମାସ ବା ଋତୁରେ ଚାଷପାଇଁ କମ୍ ବର୍ଷା ହେଲା। ତେବେ ଆପଣ କ୍ଷତିପୂରଣ ପାଇବେ। ଏହି ଦ୍ୱେୟ କେତେ ବୃଷ୍ଟିପାତ କମ୍ ହୋଇଛି, ତାହା ଉପରେ ଆଧାରିତ। ଏହା କେତେ ଉତ୍ପାଦନ କମ୍ ହୋଇଛି ତାହା ଉପରେ ଆଧାରିତ ନୁହେଁ। ଆପଣଙ୍କର ସ୍ଥାନୀୟ ପାଣିପାଗ କେନ୍ଦ୍ର ବା ଆପଣ ନିଜ କୃଷିକ୍ଷେତ୍ରର ପାଣିପାଗ କେନ୍ଦ୍ରର ପୁରୁଣା ବୃଷ୍ଟିପାତ ଦସ୍ତାବିଜରୁ ତଥ୍ୟ ସଂଗ୍ରହ କରାଯାଇ ବୀମା ବୃତ୍ତିନାମାରେ ଉଲ୍ଲେଖ କରାଯାଇଥାଏ।

୧୯. ନିମ୍ନୋକ୍ତ ପାଣିପାଗ ଘଟଣାଗୁଡ଼ିକ ମଧ୍ୟରୁ କେଉଁଟିରେ ଆପଣ ଦାୟିତ୍ୱ ପରିଚାଳନା ପଦ୍ଧତି ପାଇଁ ଆଗ୍ରହ ପ୍ରକାଶ କରନ୍ତି। ଯେଉଁଥିପାଇଁ ଆପଣ ଉଚିତ୍ ଦେୟ ଦିଅନ୍ତି ଓ କ୍ଷତିପୂରଣ ଗ୍ରହଣ କରନ୍ତି। ପରିମାପକ, ୧-ଆଗ୍ରହ ନାହିଁ, ୨-ସାମାନ୍ୟ ଆଗ୍ରହ, ୩-ମଧ୍ୟମଧାରୀର ଆଗ୍ରହ, ୪-ଅଧିକ ଆଗ୍ରହ ଓ ୫-ବହୁତ ଅଧିକ ଆଗ୍ରହ (ସବୁଠାରୁ ପ୍ରଜୁଯ୍ୟ ଉତ୍ତରଟି ଗୋଲେଇ କରି ଚିହ୍ନିତ କର)

ପାଣିପାଗ ଘଟଣାଗୁଡ଼ିକ	ଆଗ୍ରହ ନାହିଁ				ବହୁତ ଅଧିକ ଆଗ୍ରହ
ସଙ୍କଟାପନ୍ନ ଅବସ୍ଥାରେ ଅଧିକ ବୃଷ୍ଟିପାତ	୧	୨	୩	୪	୫
ସଙ୍କଟାପନ୍ନ ଅବସ୍ଥାରେ ଅଧିକ ଗରମ	୧	୨	୩	୪	୫
ଅନେକ ସମୟ ଧରି ନିଅଣ୍ଟିଆ ବୃଷ୍ଟିପାତ	୧	୨	୩	୪	୫
ଅନେକ ସମୟଧରି ଥଣ୍ଡା ପାଣିପାଗ	୧	୨	୩	୪	୫
ଅଧିକ ବେଗରେ ପବନ	୧	୨	୩	୪	୫
ଅନ୍ୟାନ୍ୟ (ଦୟାକରି ଲେଖ_____)	୧	୨	୩	୪	୫

୨୦.ଦୟାକରି ଦର୍ଶାଅ ଯେ ଆପଣଙ୍କ ଅନୁସାରେ ପାଣିପାଗବୀମା ପରିଚାଳନା କାର୍ଯ୍ୟ ସମୟ ପାଇଁ କେତେ ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ଅଟେ। ପରିମାପକ; ୧-ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ନୁହେଁ, ୨-କମ୍ ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ, ୩- ନିରପେକ୍ଷ, ୪-ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ଏବଂ ୫-ଅତିଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ (ସବୁଠାରୁ ଅଧିକ ପ୍ରଜୁଦ୍ୟ ଉତ୍ତରଟିକୁ ଗୋଲେଇ କରି ଚିହ୍ନିତ କର)

ପରିଚାଳନା କାର୍ଯ୍ୟ ସମୟ	ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ ନୁହେଁ				ଅତି ଗୁରୁତ୍ୱପୂର୍ଣ୍ଣ
ଚାରା ରୋପଣ	୧	୨	୩	୪	୫
ବେଉଷଣ	୧	୨	୩	୪	୫
ଅମଳ	୧	୨	୩	୪	୫

୨୧. ସାଧାରଣତଃ, ଆପଣ କେଉଁଠାରୁ ତାପମାତ୍ରା ଓ ବର୍ଷା ସମ୍ବନ୍ଧୀୟ ତଥ୍ୟ ପାଇଥାଆନ୍ତି ?

କ) ମୁଁ ପାଣିପାଗ ସୂଚନା ପାଇନଥାଏ.....

ଖ) ସ୍ଥାନୀୟ ପାଣିପାଗ କେନ୍ଦ୍ର.....

ଗ) ନିଜ କ୍ଷେତ୍ରର ପାଣିପାଗ କେନ୍ଦ୍ର.....

ଘ) ଟେଲିଭିଜନ.....

ଙ) ରେଡ଼ିଓ.....

ଚ) ଅନ୍ୟାନ୍ୟ ଉପାୟ (ଦୟାକରି ଲେଖ.....)

୨୨. ଆପଣଙ୍କ ଜାଣିବା ଅନୁସାରେ, ଆପଣଙ୍କର କ୍ଷେତଠାରୁ ସ୍ଥାନୀୟ ସରକାରୀ ପାଣିପାଗ କେନ୍ଦ୍ର ଆନୁମାନିକ କେତେ ଦୂରତ୍ୱରେ ଅବସ୍ଥିତ

କ) କିଲୋମିଟର.....

ଖ) ଯଦି ଦୂରତ୍ୱ ଜାଣି ନାହାନ୍ତି, ତେବେ ଗ୍ରାମ ବା ଅବସ୍ଥିତି ବା ପାଖ ପାଣିପାକଗ କେନ୍ଦ୍ର ନାମ ଲେଖ.....

ଗ) ଜଣା ନାହିଁ.....

୨୩. ଆପଣଙ୍କର ଜାଣିବା ଅନୁସାରେ ନିକଟସ୍ଥ ପାଣିପାଗ କେନ୍ଦ୍ରରେ ରେକର୍ଡ଼ କରାଯାଉଥିବା ତାପମାତ୍ରା ଓ ବୃଷ୍ଟିପାତ ଆପଣଙ୍କ କ୍ଷେତର ପ୍ରକୃତ ତାପମାତ୍ରା ଓ ବୃଷ୍ଟିପାତ ସହିତ କିପରି ସମ୍ବନ୍ଧ ରହିଥାଏ। ପୁରାପୁରି ସମାନ ଥାଏ....., ପ୍ରାୟ ସମାନ ଥାଏ....., ଟିକେଟିକେ ସମାନ ଥାଏ....., ଆଦୌ ସମାନ ନଥାଏ.....ଜାଣିନାହିଁ.....

ଚ. କୃଷି ଋଣ ଓ ଦାୟିତ୍ୱ ପରିଚାଳନା

୨୪. ଆପଣଙ୍କର କିଛି ଋଣ ପରିଶୋଧ କରିବାର ଅଛି କି ? ହଁ.....ନାହିଁ.....

୨୫. ଯଦି ହଁ, ତେବେ ଦୟାକରି ଦର୍ଶାଅ ଯେ, ବନ୍ଧୁ, ସମ୍ପର୍କୀୟ, ସାହୁକାର, ଆରସିସି ଓ ବାଣିଜ୍ୟିକ ବ୍ୟାଙ୍କ ଏ ସମସ୍ତଙ୍କଠାରୁ କେତେ ଟଙ୍କା ଋଣ କରିଛନ୍ତି।

୨୬. ଯଦି ହଁ, ତେବେ ଦୟାକରି ଦର୍ଶାଅ ଯେ, ଆପଣଙ୍କର ମୋଟ କୃଷିଋଣ ଗତବର୍ଷ ମୋଟ ପରିସମ୍ପତ୍ତିର କେତେ ଭାଗ ଅଟେ।

..... ୦-୨୦% ..... ୨୧-୨୫% ..... ୨୬-୩୦% ୩୧-୩୫%

..... ୩୬-୪୦% ..... ୪୧-୪୫% ..... ୪୬-୫୦% ..... ୫୧-୬୦% ଯ

..... ୬୧-୬୦% ..... ୬୦% ରୁ ଅଧିକ

..... ଜଣାନାହିଁ

୨୬. ଯଦି ଆପଣ ଆପଣଙ୍କର ସମସ୍ତ ପରିସମ୍ପତ୍ତି ବିକ୍ରୟ କରନ୍ତି (ଗୃହ, ଜମି, ପଶୁସମ୍ପଦ, କୃଷିଜାତଦ୍ରବ୍ୟ ଇତ୍ୟାଦି), ତେବେ କେତେ ମିଳିବ (ଟଙ୍କାରେ).....

ପ୍ରଶ୍ନକର୍ତ୍ତା: ଏହି ପ୍ରଶ୍ନର ଉତ୍ତର ଦେବା ଜଟିଳ ହୋଇପାରେ, କାରଣ ପରିସମ୍ପତ୍ତିର ମୂଲ୍ୟ ଆକଳନ କରିବାକୁ ପଡ଼ିବ। ଯଦି ଉତ୍ତରଦାତା ଜାଣି ନାହାନ୍ତି ବା ବୁଝିପାରୁନାହାଁନ୍ତି, ତେବେ 'ଜଣାନାହିଁ' ବୋଲି ଲେଖିଦିଅନ୍ତୁ।

୨୮. ଯଦି ହଁ, ଦୟାକରି ଆପଣ କାହାଠାରୁ କେତେ ଋଣ ନେଇଛନ୍ତି, ତାହାର ପ୍ରତିଶତ ଦର୍ଶାଇବେ କି (ପ୍ରକୃତରେ ୨୬)

କ) ସମ୍ପର୍କୀୟ.....

ଖ) ବନ୍ଧୁ.....

ଗ) ସାହୁକାର.....

ଘ) ଗ୍ରାମ୍ୟଋଣ ସମବାୟ.....

ଙ) ବ୍ୟାଙ୍କ୍.....

ଚ) ଅନ୍ୟାନ୍ୟ.....

ପ୍ରଶ୍ନକର୍ତ୍ତା: 'କ' ଠାରୁ 'ଘ' ପର୍ଯ୍ୟନ୍ତ ୧୦୦ ପ୍ରତିଶତ ପାଇବା ପାଇଁ ଚେଷ୍ଟାକର। ଯଦି ଅସୁବିଧା ହୁଏ, ତେବେ କ+ଖ+ଗ+ଘର ସମଷ୍ଟି ଓ 'ଅନ୍ୟାନ୍ୟରେ' ୧୦୦ ର ପାର୍ଥକ୍ୟ ଦର୍ଶାଅ; ଯଦି ଆପଣ ପ୍ରତିଶତ ବାହାର କରିବାକୁ ଅସୁବିଧା ହେଉଛି ତେବେ ଟଙ୍କା ଆକାରରେ ପରିମାଣଗୁଡ଼ିକ ଲେଖ।

୨୮. ଆପଣଙ୍କର ମୋଟ ଋଣ, ପରିସମ୍ପତ୍ତି ଓ ଉତ୍ପାଦନଶୀଳତାକୁ ନେଇ ଆପଣଙ୍କର ଋଣ ବୋଝ କିପରି ହୋଇଥିବ ବୋଲି ଆପଣ ଭାବୁଛନ୍ତି ? ପରିମାପକ ୧ ରୁ ୫, ୧-ଅତିକମ୍, ୨-କମ୍, ୩-ଯଥେଷ୍ଟ, ୪-ଅଧିକ, ୫-ଅତ୍ୟଧିକ (ସବୁଠାରୁ ପ୍ରଯୁଜ୍ୟ ଉତ୍ତରଟି ଗୋଲେଇ କରି ଚିହ୍ନିତ କର)

୧-ଅତିକମ୍, ୨-କମ୍, ୩-ଯଥେଷ୍ଟ, ୪-ଅଧିକ, ୫-ଅତ୍ୟଧିକ

୨୯. ପ୍ରଶ୍ନକର୍ତ୍ତା '' ଏହା ବହୁତ ସହାୟକ ହେବ। ବର୍ତ୍ତମାନ ଆପଣ ବିଭିନ୍ନ ଉପାୟରୁ ନିକଟରେ ଆଣିଥିବା ଋଣର ସୁଧହାର ବିଷୟରେ ପ୍ରଶ୍ନ କରିବାକୁ ଚାହୁଁଛି। ପ୍ରତ୍ୟେକ ପ୍ରକାର ଋଣଦାତା ପାଇଁ ମୁଁ ଆପଣଙ୍କ ପାଇଁ ଧାର୍ଯ୍ୟ ହୋଇଥିବା 'ପ୍ରକୃତ' ସୁଧହାର ଲେଖିବି, ଯଦି ଆପଣ ଋଣ ନେଇଥାଆନ୍ତି। ଯଦି ଆପଣ କାହାଠାରୁ ଋଣ ନ ନେଇଥାଆନ୍ତି, ତେବେ ଆପଣ 'ବିଶ୍ୱାସ' କରୁଥିବା ସୁଧହାର ମୁଁ ଲେଖିବି, ଯାହା କି ଆପଣ ଆପଣଙ୍କର ସାଙ୍ଗସାଥିଠାରୁ ବା ଅନ୍ୟ କୌଣସି ସୂତ୍ରରୁ ଜାଣିଛନ୍ତି।'' (ପ୍ରଶ୍ନକର୍ତ୍ତା: ପ୍ରତ୍ୟେକ ଥର 'ପ୍ରକୃତ' 'ବିଶ୍ୱାସକରେ' ଓ 'ଜଣାନାହିଁ' ପଢ଼ି ଶୁଣାଇବେ)।

କ. ସମ୍ପର୍କୀୟ: ପ୍ରକୃତ.....ବିଶ୍ୱାସକରେ.....ଜଣାନାହିଁ.....

ଖ. ବନ୍ଧୁ: ପ୍ରକୃତ.....ବିଶ୍ୱାସକରେ.....ଜଣାନାହିଁ.....

ଗ. ସାହୁକାର: ପ୍ରକୃତ.....ବିଶ୍ୱାସକରେ.....ଜଣାନାହିଁ.....

ଘ. ବ୍ୟାଙ୍କ: ପ୍ରକୃତ.....ବିଶ୍ୱାସକରେ.....ଜଣାନାହିଁ.....

ଙ. ଅନ୍ୟାନ୍ୟ: ପ୍ରକୃତ.....ବିଶ୍ୱାସକରେ.....ଜଣାନାହିଁ.....

୩୦. ଆପଣଙ୍କୁ ବ୍ୟାଙ୍କ କିମ୍ବା ଆରସିସି ଋଣ ଦେବା ପାଇଁ କେବେ ମନା କରିଛି କି ? ହଁ....., ନାହିଁ.....

୩୧. ଯଦି ହଁ, ତେବେ ଋଣ ଦେବାପାଇଁ ମନା କରିବାର କାରଣ କ'ଣ ? (ଉତ୍ତର ଗୋଟିକରୁ ଅଧିକ ହୋଇପାରେ)

କ. ବନ୍ଧକର ଅଭାବ.....
ଖ. ଶସ୍ୟ ବା ପଶୁସମ୍ପଦ ମୂଲ୍ୟରେ ଅଧିକ ଅସୁବିଧା ରହିଥିବାରୁ.....
ଗ. ଉତ୍ପାଦନରେ ଅଧିକ ଅସୁବିଧା ରହିଥିବାରୁ.....
ଘ. ଶସ୍ୟ ଅମଳ ପାଣିପାଗ ଦ୍ୱାରା ଅତ୍ୟଧିକ କ୍ଷତିଗ୍ରସ୍ତ ହେବାର ସମ୍ଭାବନା ଯୋଗୁ.....
ଙ. ମୁଁ ପୂର୍ବରୁ ଋଣ ପରିଶୋଧ କରିପାରିନଥିବା ହେତୁ.....
ଚ. ମୁଁ ବିଶ୍ୱାସ ଯୋଗ୍ୟ ନୁହେଁ ବୋଲି ବ୍ୟାଙ୍କ ଭାବୁଥିବାରୁ .....
ଛ. ମୁଁ ଯଥେଷ୍ଟ ଆୟ କରୁନାହିଁ ବୋଲି ବ୍ୟାଙ୍କ ଭାବୁଥିବାରୁ.....
ଜ. ଗ୍ରାମ୍ୟଋଣ ସମବାୟ ଦ୍ୱାରା ପ୍ରସ୍ତୁତ ପରିଶୋଧ ସମୟ ମୋ କ୍ଷେତର ଶସ୍ୟ ବିକ୍ରୀକରିବା ସମୟ ସହିତ ସମାନ ନ ରହିବା ହେତୁ.....

୩୨. ତୁମେ କେବେ ଯେତେ ଋଣ ଚାହିଁଛ, ସେତେ ଋଣ ବ୍ୟାଙ୍କ୍ ବା ଗ୍ରାମ୍ୟଋଣ ସମବାୟଠାରୁ ପାଇଛ ?

କ. କେବେବି ନୁହେଁ.....
ଖ. କେବେ କେବେ .....
ଗ. ଯଦି 'ଖ', ତେବେ ଆପଣ ମାଗିଥିବା ଋଣର କେତେ ପ୍ରତିଶତ ଆପଣଙ୍କୁ ସମ୍ପୂର୍ଣ୍ଣରୂପେ ମିଳିଛି.....
ଘ. ସର୍ବଦା.....

୩୩. ଆପଣ ଋଣ ପରିଶୋଧ କରିବାର କେବେ ବିଳମ୍ବ କରିଛନ୍ତି ? (ପ୍ରଶ୍ନକର୍ତ୍ତା: 'ବିଳମ୍ବ' କହିବାର ଅର୍ଥ ଋଣଦାତାଙ୍କ ସହିତ ପରିଶୋଧ ଚୁକ୍ତିନାମାରେ ରହିଥିବା ତାରିଖରେ ପରିଶୋଧ ନକରିପାରିବା କିନ୍ତୁ ପରବର୍ତ୍ତୀ ଅବସ୍ଥାରେ ଋଣପରିଶୋଧ ହୋଇଥାଏ)

କ) ସମ୍ପର୍କୀୟ ହଁ.....ନାହିଁ.....
ଖ) ବନ୍ଧୁ ହଁ.....ନାହିଁ.....
ଗ) ସାହୁକାର ହଁ.....ନାହିଁ.....
ଘ) ଗ୍ରାମ୍ୟଋଣ ସମବାୟ ହଁ.....ନାହିଁ.....
ଙ) ବାଣିଜ୍ୟିକ ବ୍ୟାଙ୍କ୍ ହଁ.....ନାହିଁ.....
ଚ) ଅନ୍ୟାନ୍ୟ ହଁ.....ନାହିଁ.....

୩୪. ଆପଣ କେବେ ଋଣ ପରିଶୋଧ କରିବାରେ ବିଫଳ (ଋଣ ପରିଶୋଧ କରି ନାହିଁ) ହୋଇଛ ? (ପ୍ରଶ୍ନକର୍ତ୍ତା: ଋଣ ପରିଶୋଧରେ ବିଫଳର ଅର୍ଥ ବୁଝି ଅନୁଯାୟୀ ଋଣ ଋଣଦାତାଙ୍କୁ କେବେବି ପରିଶୋଧ କରାଯାଇନାହିଁ।

କ) ସମ୍ପର୍କୀୟ ହଁ.....ନାହିଁ.....
ଖ) ବନ୍ଧୁ ହଁ.....ନାହିଁ.....
ଗ) ସାହୁକାର ହଁ.....ନାହିଁ.....
ଘ) ଗ୍ରାମ୍ୟଋଣ ସମବାୟ ହଁ.....ନାହିଁ.....

ଙ) ବାଣିଜ୍ୟିକ ବ୍ୟାଙ୍କ୍ ହଁ.....ନାହିଁ.....

ଚ) ଅନ୍ୟାନ୍ୟ ହଁ.....ନାହିଁ.....

ପ୍ରଶ୍ନକର୍ତ୍ତା: ମୁଁ ବର୍ତ୍ତମାନ 'ଉଧାର ପରିବେଶ' ବିଷୟରେ କିଛିଟା ପ୍ରଶ୍ନ କରିବାକୁ ଚାହେଁ। ଆପଣ ତଳେ ଦିଆଯାଇଥିବା ଉତ୍ତରଗୁଡ଼ିକରୁ ଗୋଟିଏ ବାଛିବେ।

ସମ୍ପୂର୍ଣ୍ଣ ରାଜି, ସାମାନ୍ୟରାଜି, ରାଜି, ଅରାଜି, ଆଦୌ ରାଜି ନୁହେଁ (ପ୍ରଶ୍ନକର୍ତ୍ତା ପ୍ରତ୍ୟେକ ପ୍ରଶ୍ନ ପଢ଼ିସାରିବାପରେ 'ସମ୍ପୂର୍ଣ୍ଣରାଜି'ଠାରୁ ଆରମ୍ଭ କରି ତାଲିକାଟିକୁ ପଢ଼ନ୍ତୁ)

୩୫. ସାହୁକାରମାନେ ଋଣ ପ୍ରଦାନ ସର୍ତ୍ତଗୁଡ଼ିକରେ ଆରସିସିମାନଙ୍କଠାରୁ ଅଧିକ ନମନୀୟ
ସମ୍ପୂର୍ଣ୍ଣରାଜି....., ସାମାନ୍ୟରାଜି..... ରାଜି....., ଅରାଜି....., ଆଦୌରାଜିନୁହେଁ

୩୬. ସମ୍ପର୍କୀୟମାନେ ଋଣ ପ୍ରଦାନ ସର୍ତ୍ତଗୁଡ଼ିକରେ ଗ୍ରାମ୍ୟ ଋଣସମବାୟମାନଙ୍କଠାରୁ ଅଧିକ ନମନୀୟ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୩୭. ବନ୍ଧୁମାନେ ଋଣପ୍ରଦାନ ସର୍ତ୍ତଗୁଡ଼ିକରେ ଗ୍ରାମ୍ୟ ଋଣସମବାୟଙ୍କଠାରୁ ଅଧିକ ନମନୀୟ
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୩୮. ସମ୍ପର୍କୀୟ ଓ ବନ୍ଧୁମାନଙ୍କଠାରୁ ଉଧାର ସେମାନଙ୍କୁ ଅସୁବିଧା କରାଏ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୩୯. ଏକ ଋଣ ପାଇବାପାଇଁ ମୁଁ ଆରସିସି ସୁଧହାରଠାରୁ ଅଧିକ ଦେବା ପାଇଁ ଆଗ୍ରହୀ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୪୦. ଆପଣ ନିଜର ପୁରୁଣା ଋଣ କଥା ମନେପକାଇ କୁହନ୍ତୁ, ଯେ ଆପଣ କାହିଁକି ଋଣ କରିଥିଲେ (ପ୍ରଶ୍ନକର୍ତ୍ତା ତାଲିକାଭୁକ୍ତ ବିଷୟଗୁଡ଼ିକ ପଢ଼ନ୍ତୁ।

କ. ସ୍ୱାସ୍ଥ୍ୟ ବା ଔଷଧ.....

ଖ. ବିବାହ.....

ଗ. ଶୁଦ୍ଧକାର୍ଯ୍ୟ.....

ଘ. ସ୍କୁଲ ଦରମା.....

ଙ. ଚାଷକାମ ପାଇଁ (ରାସାୟନିକ ସାର, ବିହନ, ମୁଲିଆ ମଜୁରୀ ଇତ୍ୟାଦି).....

ଚ. ମେସିନ୍ ଓ ଯନ୍ତ୍ରପାତି.....

ଛ. ଗୃହ ନିର୍ମାଣ.....

ଜ. ଗୃହ ଖର୍ଚ୍ଚ.....

ଝ. ଛୁଟିଦିନ କଟାଇବା ପାଇଁ.....

ଞ. ଅନ୍ୟାନ୍ୟ (ପ୍ରଶ୍ନକର୍ତ୍ତା ବିଷୟଗୁଡ଼ିକ ଲେଖନ୍ତୁ).....

ପ୍ରଶ୍ନକର୍ତ୍ତା: *ଆପଣମାନେ ଧର୍ଯ୍ୟ ପାଇଁ ଆପଣମାନଙ୍କୁ ଧନ୍ୟବାଦ। 'ବିଶ୍ୱାସନୀୟତା' ବିଷୟରେ ମୋ ପାଖରେ କେତୋଟି ପ୍ରଶ୍ନ ଅଛି, ତାହା ମୁଁ ପଚାରିବାକୁ ଚାହୁଁଛି। ତଳେ ଦିଆଯାଇଥିବା ଉତ୍ତରଗୁଡ଼ିକରୁ ଗୋଟିଏ ଉତ୍ତର ଚିହ୍ନିତ କରି- ସମ୍ପୂର୍ଣ୍ଣରାଜି, ସାମାନ୍ୟ ରାଜି, ରାଜି, ଅରାଜି, ଆଦୌ ରାଜି ନୁହେଁ* (ପ୍ରଶ୍ନକର୍ତ୍ତା ପ୍ରତ୍ୟେକ ପ୍ରଶ୍ନ ପଢ଼ିସାରିବା ପରେ 'ସମ୍ପୂର୍ଣ୍ଣ ରାଜି'ଠାରୁ ଆରମ୍ଭ କରି ସବୁ ଉତ୍ତରଗୁଡ଼ିକ ଉଚ୍ଚାରଣ କରିବେ)

୪୧. ଯଦି ଆପଣ ପରିବାରର କୌଣସି ସଦସ୍ୟ ବା ସମ୍ପର୍କୀୟଙ୍କୁ ଋଣ ପ୍ରଦାନ କରନ୍ତି, ଆପଣ 'ବିଶ୍ୱାସ' କରନ୍ତି ଯେ ସେ ଠିକ୍ ସମୟରେ ଋଣ ପରିଶୋଧ କରିଦେବେ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି(୫)....,ସାମାନ୍ୟରାଜି(୪).....,ରାଜି(୩).....,ଅରାଜି(୨).....,ଆଦୌରାଜି ନୁହେଁ(୧).....

୪୨. ଯଦି ଆପଣ ଜଣେ ବନ୍ଧୁଙ୍କୁ ଋଣ ପ୍ରଦାନ କରନ୍ତି, ତେବେ ଆପଣ ତାଙ୍କୁ 'ବିଶ୍ୱାସ' କରନ୍ତି ଯେ ସେ ଠିକ୍ ସମୟରେ ଋଣ ଫେରସ୍ତ କରି ଦେବେ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୪୩. ଯଦି ପରିବାରର କୌଣସି ସଦସ୍ୟ ବା କେହି ସମ୍ପର୍କୀୟ ଆପଣଙ୍କୁ ଋଣ ପ୍ରଦାନ କରନ୍ତି, ତେବେ ସେ ଆପଣଙ୍କୁ 'ବିଶ୍ୱାସ' କରିଥାଆନ୍ତି ଯେ, ଆପଣ ଋଣ ଠିକ୍ ସମୟରେ ଋଣ ଫେରସ୍ତ କରିଦେବେ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୪୪. ଯଦି କେହି ବନ୍ଧୁ ଆପଣଙ୍କୁ ଋଣ ପ୍ରଦାନ କରନ୍ତି, ତେବେ ସେ ଆପଣଙ୍କୁ 'ବିଶ୍ୱାସ' କରିଥାନ୍ତି ଯେ, ଆପଣ ଠିକ୍ ସମୟରେ ଋଣ ଫେରସ୍ତ କରିଦେବେ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୪୫. ଆପଣଙ୍କ ସାହିବସ୍ତିରେ ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନଙ୍କ ମଧ୍ୟରେ ଯେଉଁ ଅନୌପଚାରିକ ଧାରଉଧାର ହୋଇଥାଏ, ତାହା ପରସ୍ପର ଉପରେ ବିଶ୍ୱାସ ଥିବା ଯୋଗୁଁ ସମ୍ଭବ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୪୬. ଆପଣଙ୍କର ବନ୍ଧୁ ବା ସମ୍ପର୍କୀୟର ଋଣ ଫେରସ୍ତ ବିଶ୍ୱାସନୀୟତା ନଥିଲେ ମଧ୍ୟ ଆପଣଙ୍କ ପାଖରେ ଟଙ୍କା ଥିଲେ ଆପଣ ତାଙ୍କୁ ଉଧାର ଦିଅନ୍ତି।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୪୭. ଯଦି ଆପଣ ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟରୁ ଏକ ଋଣ ନେବାକୁ ଚାହାନ୍ତି ଓ ଆପଣଙ୍କ ପାଖରେ ଋଣ ନେବାପାଇଁ ବନ୍ଧକ ଦେବାକୁ କିଛି ନାହିଁ, ତଥାପି ଆରସିସି ଆପଣଙ୍କୁ ଋଣ ଦେଇଥାଏ କାରଣ ଆରସିସି ଆପଣଙ୍କୁ ବିଶ୍ୱାସ କରେ ଯେ ଆପଣ ଋଣ ପରିଶୋଧ କରିବେ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୪୮. ଯଦି ଆପଣ ବ୍ୟାଙ୍କରୁ ଏକ ଋଣ ନେବାକୁ ଚାହାନ୍ତି ଓ ଆପଣଙ୍କ ପାଖରେ ଋଣ ନେବାପାଇଁ ବନ୍ଧକ ଦେବାକୁ କିଛି ନାହିଁ, ତଥାପି ବ୍ୟାଙ୍କ ଆପଣଙ୍କୁ ଋଣ ଦେଇଥାଏ, କାରଣ ବ୍ୟାଙ୍କ ଆପଣଙ୍କୁ ବିଶ୍ୱାସ କରେ ଯେ ଆପଣ ଋଣ ପରିଶୋଧ କରିପାରିବେ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୪୯. ଯଦି ଆପଣ ସାହୁକାରଙ୍କଠାରୁ ଏକ ଋଣ ନେବାକୁ ଚାହାନ୍ତି ଓ ଆପଣଙ୍କର ପାଖରେ ଋଣ ନେବାପାଇଁ ବନ୍ଧକ ଦେବାକୁ କିଛି ନାହିଁ, ତଥାପି ବ୍ୟାଙ୍କ୍ ଆପଣଙ୍କୁ ଋଣ ଦେଇଥାଏ, କାରଣ ସାହୁକାର ଆପଣଙ୍କୁ ବିଶ୍ୱାସ କରେ ଯେ ଆପଣ ଋଣ ପରିଶୋଧ କରିପାରିବେ।

୫୦. ପ୍ରଶ୍ନକର୍ତ୍ତା: *ଏହା ଶେଷ ପ୍ରଶ୍ନ: ଏହା ଏକ ପରିକଳ୍ପିତ ପରିସ୍ଥିତି। ଧରାଯାଉ ଯେ ଆପଣ ସାହୁକାର, ବନ୍ଧୁ, ସମ୍ପର୍କୀୟ, ଗ୍ରାମ୍ୟଋଣ ସମବାୟ ଓ ବ୍ୟାଙ୍କଠାରୁ ୧୦୦୦ ଟଙ୍କା ଲେଖାଏଁ ମୋଟ ୫୦୦୦ଟଙ୍କା ଋଣ କରିଛନ୍ତି। ବର୍ତ୍ତମାନ ଯଦି ଆପଣଙ୍କ ପାଖରେ ଋଣ ପରିଶୋଧ ପାଇଁ ୧୦୦୦ଟଙ୍କା ହୁଏ, ତେବେ ନିମ୍ନଲିଖିତଗୁଡ଼ିକରୁ କାହାର ଋଣ ପରିଶୋଧ କରିବେ (ଗୋଟିଏ ବାଛ)?*

କ) ଆପଣ ଅନ୍ୟମାନଙ୍କୁ ଦେବା ପୂର୍ବରୁ ପରିବାର ସଦସ୍ୟ ବା ସମ୍ପର୍କୀୟମାନଙ୍କର ଟଙ୍କା ଫେରସ୍ତ କରିବେ

ଖ) ଆପଣ ଅନ୍ୟମାନଙ୍କୁ ଦେବା ପୂର୍ବରୁ ବନ୍ଧୁଙ୍କର ଟଙ୍କା ଫେରସ୍ତ କରିବେ

ଗ) ଆପଣ ଅନ୍ୟମାନଙ୍କୁ ଦେବା ପୂର୍ବରୁ ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟର ଟଙ୍କା ଫେରସ୍ତ କରିବେ।

ଘ) ଆପଣ ଅନ୍ୟମାନଙ୍କୁ ଦେବା ପୂର୍ବରୁ ବାଣିଜ୍ୟିକ ବ୍ୟାଙ୍କରୁ ଟଙ୍କା ଫେରସ୍ତ କରିବେ

ଙ) ଆପଣ ଅନ୍ୟମାନଙ୍କୁ ଦେବା ପୂର୍ବରୁ ସାହୁକାରର ଟଙ୍କା ଫେରସ୍ତ କରିବେ।

ଚ) ଆପଣ ସବୁ ଋଣଦାତାଙ୍କର କିଛି କିଛି ଟଙ୍କା ଫେରସ୍ତ କରିବେ।

ଦୋଷୀମନୋଭାବ ପ୍ରଶ୍ନ:

୫୧. କ. ଆପଣ କେବେ ପରିବାର ସଦସ୍ୟଙ୍କଠାରୁ ନେଇଥିବା ଋଣ ପରିଶୋଧ କରିବାରେ ଖିଲାପ କରିଛନ୍ତି କି ?
ହଁ... ....., ନାହିଁ.... ....

ଖ. ଯଦି ହଁ, ତେବେ ଆପଣ ନିଜକୁ କେତେ ଦୋଷୀ ମନେକରୁଛନ୍ତି ?
ଆଦୌ ଦୋଷୀ ନୁହେଁ ୧୨୩୪୫୬୭୮ ସମ୍ପୂର୍ଣ୍ଣ ଦୋଷୀ

ଗ. ଯଦି ନାହିଁ, ତେବେ ଯଦି ଆପଣ ଖିଲାପ କରିଥାଆନ୍ତେ, ତେବେ ଆପଣ ନିଜକୁ କେତେ ଦୋଷୀ ମନେ କରିଥାଆନ୍ତେ ?
ଆଦୌ ଦୋଷୀ ନୁହେଁ ୧୨୩୪୫୬୭୮ ସମ୍ପୂର୍ଣ୍ଣ ଦୋଷୀ

୫୨. କ. ଆପଣ କେବେ ପଡ଼ୋଶୀଙ୍କ ଋଣ ପରିଶୋଧ କରିବାରେ ଖିଲାପ କରିଛନ୍ତି ? ହଁ.....ନାହିଁ.....

ଖ. ଯଦି ହଁ, ତେବେ ଆପଣ ନିଜକୁ କେତେ ଦୋଷୀ ମନେକରୁଛନ୍ତି ?
ଆଦୌ ଦୋଷୀ ନୁହେଁ ୧୨୩୪୫୬୭୮ ସମ୍ପୂର୍ଣ୍ଣ ଦୋଷୀ

ଗ. ଯଦି ନାହିଁ, ତେବେ ଯଦି ଆପଣ ଖିଲାପ କରିଥାଆନ୍ତେ, ତେବେ ଆପଣ ନିଜକୁ କେତେ ଦୋଷୀ ମନେ କରିଥାଆନ୍ତେ ?
ଆଦୌ ଦୋଷୀ ନୁହେଁ ୧୨୩୪୫୬୭୮ ସମ୍ପୂର୍ଣ୍ଣ ଦୋଷୀ

୫୩. କ. ଆପଣ କେବେ ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟ ଋଣ ପରିଶୋଧ କରିବାରେ ଖିଲାପ କରିଛନ୍ତି ? ହଁ..... ନାହିଁ.....

୫୪. କ. ଆପଣ କେବେ କୌଣସି ବିତ୍ତ ଅନୁଷ୍ଠାନର ଋଣ ପରିଶୋଧ କରିବାରେ ଖିଲାପ କରିଛନ୍ତି ? ହଁ.....ନାହିଁ.....

୫୫. କ. ଆପଣ କେବେ କୌଣସି ସାହୁକାରଙ୍କର ଋଣ ପରିଶୋଧ କରିବାରେ ଖିଲାପ କରିଛନ୍ତି ହଁ.....ନାହିଁ.....

୫୬. ପରିବାର ଆୟର କେତେଭାଗ ଆପଣ ସଞ୍ଚୟ କରିବା ପାଇଁ ସକ୍ଷମ ହୋଇଥାଆନ୍ତି (ଟଙ୍କାରେ):
(କ) କିଛି ନୁହେଁ (ଖ)୫%ରୁ କମ୍ (ଗ) ୫ ଓ ୧୦ % ମଧ୍ୟରେ (ଘ) ୧୦% ରୁ ଅଧିକ

୫୭. ଯଦି ଆପଣଙ୍କ ଆୟ ଅନିଶ୍ଚିତତା ବହୁପରିମାଣରେ କମିଯାଏ, ତେବେ ଆପଣମାନେ କ'ଣ କରିବାକୁ ଚାହିଁବେ (ଗୋଟିଏ ବାଛ)

କ. ସଞ୍ଚୟ କମ୍ ଓ କୃଷି ଉତ୍ପାଦନରେ ଅଧିକ ନିବେଶ

ଖ. ସଞ୍ଚୟ କମ୍ ଓ ପରିବାର ଉପଭୋଗ ଦ୍ରବ୍ୟଗୁଡ଼ିକର କ୍ରୟ ବୃଦ୍ଧି
ଗ. ସଞ୍ଚ କମ୍ ଓ ଛୁଟିଦିନ କଟାଇବା ପାଇଁ ଖର୍ଚ୍ଚ ଅଧିକ
ଘ. ସଞ୍ଚୟ ପରିମାଣ ଅପରିବର୍ତ୍ତିତ ରଖିବା
ଙ. ସଞ୍ଚୟ ସାମାନ୍ୟ ଅଧିକ କରିବା
ଚ. ସଞ୍ଚୟ ବହୁତ ଅଧିକ କରିବା

୫୮. ମୁଁ ଉପଭୋଗ, ଶିକ୍ଷା ଓ ସ୍ୱାସ୍ଥ୍ୟ ପାଇଁ ଆବଶ୍ୟକ ପରିମାଣର ଟଙ୍କା, ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣସମବାୟରୁ ଋଣ କରିବାକୁ ସକ୍ଷମ
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୫୯. ମୁଁ କୃଷି ଓ ବ୍ୟବସାୟ ପାଇଁ ଆବଶ୍ୟକ ପରିମାଣର ଟଙ୍କା ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟରୁ ଋଣ କରିବାକୁ ସକ୍ଷମ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୬୦. ମୁଁ ଯେବେ ଉପଭୋଗ, ଶିକ୍ଷା ଓ ସ୍ୱାସ୍ଥ୍ୟ ପାଇଁ ଦରକାର ହେଉଥିବା ଟଙ୍କା ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟରୁ ଋଣ ପାଇବାକୁ ସକ୍ଷମ ନହୁଏ, ସେବେ ମୁଁ .....ଠାରୁ ଋଣ ସହଜ ମନେ କରେ।
କ. ସାହୁକାର.....
ଖ. ବନ୍ଧୁ.....
ଗ. ସମ୍ପର୍କୀୟ.....

୬୧. ମୁଁ ଯେବେ କୃଷି ଓ ବ୍ୟବସାୟ ପାଇଁ ଆବଶ୍ୟକ ପରିମାଣର ଟଙ୍କା ବ୍ୟାଙ୍କ ଓ ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟରୁ ଋଣ ସହଜ ମନେ କରେ।
କ. ସାହୁକାର.....
ଖ. ବନ୍ଧୁ.....
ଗ. ସମ୍ପର୍କୀୟ.....

୬୨. ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟରୁ କୌଣସି ଋଣ ପାଇବାରେ ଆପଣଙ୍କର କିଛି ଆଶଙ୍କା ଅଛି କି? ଯଦି ଥାଏ, ତେବେ ନିମ୍ନରେ ଥିବା କାରଣଗୁଡ଼ିକୁ ଚିହ୍ନଟ କର।
କ. ମୋର ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟ ବା ବ୍ୟାଙ୍କ୍‌ର ପରିଶୋଧ ହୋଇନଥିବା ପୁରୁଣା ଋଣ ଅଛି।
ସମ୍ପୂର୍ଣ୍ଣରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।
ଖ. ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟ ଋଣର ସୁଧହାର ବନ୍ଧୁ ବା ସମ୍ପର୍କୀୟଙ୍କଠାରୁ ଚାପର ସୁଧହାରଠାରୁ ଅଧିକ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।
ଗ. ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟ ଋଣର ସୁଧହାର ମୁଁ ଦେବା ପାଇଁ ସକ୍ଷମ ନୁହେଁ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।
ଘ. ଋଣ ପାଇଁ ମୋ ପାଖରେ କୌଣସି ବନ୍ଧକ ନାହିଁ
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।
ଙ. ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟ ମୋ ଘରଠାରୁ ଅନେକ ବାଟ
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।
ଚ. ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟ ବହୁତ କାଗଜପତ୍ର ଖୋଜନ୍ତି
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

ଛ. ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟ ଋଣ ଅନୁମୋଦନ କରିବାରେ ବହୁ ବିଳମ୍ବ କରନ୍ତି।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

ଜ. ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟ ଋଣକର୍ତ୍ତା ଲାଞ୍ଚ ମାଗନ୍ତି।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୫. ମୁଁ ବନ୍ଧୁ ବା ସମ୍ପର୍କୀୟମାନଙ୍କଠାରୁ ଋଣ କରିବାକୁ ପସନ୍ଦ କରେ
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

ଞ. ମୁଁ ସାହୁକାରଠାରୁ ଋଣ କରିବାକୁ ପସନ୍ଦ କରେ
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

ଟ. ମୁଁ ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟ ପାଖରେ ଋଣୀ ହେବାକୁ ଚାହେଁ ନାହିଁ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୬୩. ଯଦି ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟର ସୁଧହାର ପ୍ରଚଳିତ ସୁଧ ହାରଠାରୁ କମ୍ ହୁଏ, ତେବେ ମୁଁ ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟଠାରୁ ଋଣ ନେବାକୁ ଆଗ୍ରହ ପ୍ରକାଶ କରିବି।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୬୪. ଯଦି ଏକ ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟ ଋଣ ପାଇଁ ଖର୍ଚ୍ଚ (ପିସ୍, ଅଣ-ସୁଧଦେୟ) ପ୍ରଚଳିତ ଖର୍ଚ୍ଚଠାରୁ କମ୍ ହୁଏ, ତେବେ ମୁଁ ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟଋଣ ସମବାୟଠାରୁ ଋଣ ନେବାକୁ ଆଗ୍ରହ ପ୍ରକାଶ କରିବି।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୬୫. ଆପଣ ବ୍ୟାଙ୍କ, ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟ, ବନ୍ଧୁ ବା ସମ୍ପର୍କୀୟଙ୍କର ଋଣ ପରିଶୋଧ କରିବାରେ ଖିଲାପ କରିଥାଅ ବା ନ କରିଥାଅ, ନିମ୍ନଲିଖିତ ପରିସ୍ଥିତିଗୁଡ଼ିକରୁ କେଉଁଟି ଭବିଷ୍ୟତରେ ଆପଣ ଋଣ ଖିଲାପ କରିବାର କାରଣ ହେବା ସମ୍ଭାବନା ରହିଛି।

କ. ସାମର୍ଥ୍ୟର ଅଭାବ
ଖ. ସର୍ତ୍ତଗୁଡ଼ିକ ସ୍ପଷ୍ଟ ନଥିବା ହେତୁ
ଗ. ଶସ୍ୟହାନି, ପଶୁ ସମ୍ପଦ ନଷ୍ଟ
ଘ. ପରିବାର ସଦସ୍ୟଙ୍କର ଦେହାନ୍ତ ବା ରୋଗାକ୍ରାନ୍ତ ହେବା
ଙ. ଅନ୍ୟ ଉଦ୍ଦେଶ୍ୟରେ ଋଣ ଧନକୁ ବ୍ୟବହାର
ଚ. ଅନ୍ୟାନ୍ୟ କାରଣ

ଋଣ ବଣ୍ଟନ ପ୍ରତିକୃତି

୬୬. ଯଦି ମୋର ଅଧିକ ଜମି (ପରିସମ୍ପତ୍ତି) ଥାଏ, ତେବେ ***ସେହି ପରିସମ୍ପତ୍ତିକୁ ବନ୍ଧ ଭାବେ ବ୍ୟବହାର ନକରି*** ମୁଁ ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟରୁ ଅଧିକ ପାଇପାରିବି।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୬୭. ଯଦି ମୋର ଅଧିକ ଜମି (ପରିସମ୍ପତ୍ତି)ଥାଏ, ତେବେ ***ସେହି ପରିସମ୍ପତ୍ତିକୁ ବନ୍ଧକଭାବେ ବ୍ୟବହାର କରି*** ମୁଁ ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟରୁ ଅଧିକ ଋଣ ପାଇପାରିବି।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୬୮. ଯଦି ମୋର ଅଧିକ ଜମି (ପରିସମ୍ପତ୍ତି)ଥାଏ, ତେବେ ***ସେହି ପରିସମ୍ପତ୍ତିକୁ ବନ୍ଧକ ଭାବେ ବ୍ୟବହାର କରି*** ମୁଁ ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟରୁ କମ୍‌ସୁଧହାରେ ଅଧିକ ଋଣ ପାଇପାରିବି।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୬୯. ଯଦି ମୋର ଅଧିକ ଜମି (ପରିସମ୍ପତ୍ତି) ଥାଏ, ତା'ହେଲେ ମୁଁ ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟରୁ ସେହି ପରିସମ୍ପତ୍ତିକୁ ବନ୍ଧକ ହିସାବରେ ବ୍ୟବହାର କରି କମ୍ ସୁଧହାରରେ ଅଧିକ ଋଣ ପାଇପାରିବି।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୭୦. ମୁଁ ଭାବେ କରେ ଯେ, ସଚ୍ଚୋଟ ଋଣଗ୍ରହୀତା ଉଚ୍ଚ ହାରରେ ସୁଧ ଦେବାକୁ ବାଧ୍ୟ ହୁଅନ୍ତି। କାରଣ କେତେକ ଋଣ ଗ୍ରହୀତା ସେମାନଙ୍କର ଋଣ ପରିଶୋଧ କରନ୍ତି ନାହିଁ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୭୧. ମୁଁ ଭାବେ କରେ ଯେ, ସଚ୍ଚୋଟ ଋଣଗହୀତା ଦରକାର ପରିମାଣର ଋଣ ପାଇବା ପାଇଁ ସକ୍ଷମ ହୁଅନ୍ତି ନାହିଁ, କାରଣ କେତେକ ଗ୍ରାମବାସୀ ସେମାନଙ୍କ ଋଣ ପରିଶୋଧ କରନ୍ତି ନାହିଁ ବା ଋଣ ଅନ୍ୟ କାମରେ ବ୍ୟବହାର କରନ୍ତି।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୭୨. ଆବଶ୍ୟକ ପରିମାଣର ଋଣ ପାଇବା ପାଇଁ ମୁଁ ଅଧିକ ସୁଧହାର ଦେବାକୁ ରାଜି।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୭୩. ଆବଶ୍ୟକ ପରିମାଣର ଋଣ ପାଇବା ପାଇଁ ମୁଁ ଅଧିକ ବନ୍ଧକ ରଖିବା ପାଇଁ ରାଜି।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୭୪. ମୁଁ ଭାବେ ଯେଉଁ ଋଣ ଗ୍ରହୀତା ସେମାନଙ୍କର ଜମି ପରିସମ୍ପତ୍ତିର ମୂଲ୍ୟଠାରୁ ଅଧିକ ଋଣ ଗ୍ରହଣ କରିଥାଆନ୍ତି, ସେମାନେ ନିଜଆଡୁ ଋଣ ପରିଶୋଧ କରିବାରେ ଖିଲାପ କରନ୍ତି।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୭୫. ମୁଁ ଭାବେ ଯେଉଁ ଋଣ ଗ୍ରହୀତା ଉଚ୍ଚ ସୁଧହାରରେ ଋଣ ଗ୍ରହଣ କରନ୍ତି, ସେମାନେ ନିଜଆଡୁ ଋଣ ପରିଶୋଧ କରିବାରେ ଖିଲାପ କରନ୍ତି।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

ଋଣ ବଣ୍ଟନ ପ୍ରଭାବ

ଦୟାକରି ନିମ୍ନଲିଖିତ ପ୍ରଶ୍ନଗୁଡ଼ିକର ଉତ୍ତର ଦିଅ। ପ୍ରଶ୍ନକର୍ତ୍ତା ଏଠାରେ ଆମେ 'ଋଣ କଟକଣା' ଶବ୍ଦ ବ୍ୟବହାର କରୁଛୁ। ଋଣ କଟକଣା ଅର୍ଥ ଜଣେ ଚାଷୀ ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟରୁ ଆବଶ୍ୟକ ପରିମାଣର ଓ ଦରକାର ସମୟରେ ଋଣ ପାଇପାରିନଥାଏ।

୭୬. ଯଦି ମୁଁ କୌଣସି ଋଣ କଟକଣାର ସମ୍ମୁଖୀନ ହୁଏ, ତେବେ ମୋର କୃଷି ଆୟ ବୃଦ୍ଧି କରିବା ପାଇଁ ଦରକାର ହେଉଥିବା କଞ୍ଚାମାଲ ଠାରୁ କମ୍ ବ୍ୟବହାର କରେ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୭୭. ଯଦି ମୁଁ ଋଣ କଟକଣାର ସମ୍ମୁଖୀନ ହୁଏ, ତେବେ ମୁଁ ଅଣକୃଷି ନିଯୁକ୍ତିରୁ ଆୟ ଦରକାର କରେ।

ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୭୮. ଯଦି ମୁଁ ଋଣ କଟକଣାର ସମ୍ମୁଖୀନ ହୁଏ, ତେବେ ମୁଁ ମୋର ପିଲାମାନଙ୍କୁ ଠିକ୍ ଶିକ୍ଷା ଓ ଉପଯୁକ୍ତ ସ୍ୱାସ୍ଥ୍ୟସେବା ଦେବାପାଇଁ ସକ୍ଷମ ହୋଇ ନଥାଏ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୭୯. ଯଦି ମୁଁ ଋଣ କଟକଣାର ସମ୍ମୁଖୀନ ହୁଏ, ତେବେ ମୋର ପରିବାର ସଦସ୍ୟ(ମୋତେ ମିଶାଇ) ବର୍ଷ ସାରା ଯଥେଷ୍ଟ ଖାଦ୍ୟ ପାଇବା ପାଇଁ ସକ୍ଷମ ହୋଇନଥାଉ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୮୦. ମୁଁ ଯଦି ବ୍ୟାଙ୍କ ବା ଗ୍ରାମ୍ୟଋଣ ସମବାୟରୁ ଯଥାଯଥ ଋଣ ପାଏ, ତେବେ ମୁଁ
କ. କୃଷି ଛାଡ଼ିଦେବି ଓ ଏକ ଅଣକୃଷି ଉଦ୍ୟୋଗ ଆରମ୍ଭ କରିବି.....
ଖ. କୃଷି କ୍ଷେତ୍ରରେ ରହିବି ଏବଂ କୃଷି ଉତ୍ପାଦନ ବୃଦ୍ଧି କରିବି.....
ଗ. କୃଷି କ୍ଷେତ୍ରରେ ରହିବି ଏବଂ ଏକ ଅଣକୃଷି ଉଦ୍ୟୋଗ ଆରମ୍ଭ କରିବି.....

ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନଙ୍କ ମଧ୍ୟରେ ଅଣଆନୁଷ୍ଠାନିକ ଋଣ ପ୍ରଦାନ

୮୧. ଆପଣ କେବେ ଆପଣଙ୍କର ଜଣେ **ସାଙ୍ଗଠାରୁ** ଟଙ୍କା ଉପହାର ପାଇଛନ୍ତି, ଯାହା ଆପଣ ଫେରସ୍ତ କରିନାହାଁନ୍ତି।
ହଁ.....ନାହିଁ.....

୮୨. ଆପଣ କେବେ ଆପଣଙ୍କର ଜଣେ **ସମ୍ପର୍କୀୟ** ଟଙ୍କା ଉପହାର ପାଇଛନ୍ତି, ଯାହା ଆପଣ ଫେରସ୍ତ କରିନାହାଁନ୍ତି।
ହଁ.....ନାହିଁ.....

୮୩. ଆପଣ କେବେ ଆପଣଙ୍କର ଜଣେ **ସାଙ୍ଗକୁ** ଟଙ୍କା ଉପହାର ଦେଇଛନ୍ତି, ଯାହା ସେ ଆପଣଙ୍କୁ ଫେରସ୍ତ କରିନାହାଁନ୍ତି।
ହଁ.....ନାହିଁ.....

୮୪. ଆପଣ କେବେ ଆପଣଙ୍କର ଜଣେ **ସମ୍ପର୍କୀୟକୁ** ଟଙ୍କା ଉପହାର ଦେଇଛନ୍ତି, ଯାହା ସେ ଆପଣଙ୍କୁ ଫେରସ୍ତ କରିନାହାଁନ୍ତି।
ହଁ.....ନାହିଁ.....

୮୫. ଆପଣ **କେବେ** ଆପଣଙ୍କର ଜଣେ **ସାଙ୍ଗଠାରୁ** ଟଙ୍କା ଧାର କରିଛନ୍ତି କି ?
ହଁ.....ନାହିଁ.....

୮୬. ଆପଣ **କେବେ** ଆପଣଙ୍କର ଜଣେ **ସାଙ୍ଗକୁ** ଟଙ୍କା ଧାର ଦେଇଛନ୍ତି କି ?
ହଁ.....ନାହିଁ.....

୮୭. ଆପଣ **କେବେ** ଆପଣଙ୍କର ଜଣେ **ସମ୍ପର୍କୀୟଙ୍କଠାରୁ** ଟଙ୍କା ଧାର କରିଛନ୍ତି କି ?
ହଁ.....ନାହିଁ.....

୮୮. ଆପଣ **କେବେ** ଆପଣଙ୍କର ଜଣେ **ସମ୍ପର୍କୀୟକୁ** ଟଙ୍କା ଧାର ଦେଇଛନ୍ତି କି ?

ହଁ.....ନାହିଁ.....

୮୯. ମୁଁ ଜଣେ ସାଙ୍ଗକୁ ଟଙ୍କା ଧାର ଦେବି, ଯଦିଓ ସେ ସାଙ୍ଗ ଆଗରୁ ମୋତେ ଧାର ଦେବା ପାଇଁ ମନା କରିଥିଲେ
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୯୦. ମୁଁ ଜଣେ ସାଙ୍ଗଠାରୁ ଧାର ନେବାକୁ ସକ୍ଷମ, ଯଦିଓ ଆଗରୁ ମୁଁ ସେ ସାଙ୍ଗକୁ ଧାର ଦେବାକୁ ମନା କରିଥିଲି
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୯୧. ମୁଁ ଜଣେ ସମ୍ପର୍କୀୟଙ୍କୁ ଧାର ଦେବି ଯଦିଓ ଆଗରୁ ସେ ସମ୍ପର୍କୀୟ ଜଣକ ମୋତେ ଧାର ଦେବାକୁ ମନା କରିଥିଲେ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୯୨. ମୁଁ ଜଣେ ସମ୍ପର୍କୀୟଙ୍କଠାରୁ ଧାର ନେବାକୁ ଧାର ନେବାକୁ ସକ୍ଷମ ଯଦିଓ ମୁଁ ଆଗରୁ ସେ ସମ୍ପର୍କୀୟଙ୍କୁ ଧାର ଦେବାକୁ ମନା କରିଥିଲି।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୯୩. ମୁଁ ଜଣେ **ସମ୍ପର୍କୀୟଙ୍କଠାରୁ** ମୋର ଜରୁରୀକାଳୀନ ପରିସ୍ଥିତି (ଶସ୍ୟହାନୀ, ଗୋସମ୍ପଦ ନଷ୍ଟ, ରୋଗ ଇତ୍ୟାଦି)ରେ ଟଙ୍କା **ଉପହାର** ପାଇବା ପାଇଁ ସକ୍ଷମ
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୯୪. ମୁଁ ଜଣେ **ବନ୍ଧୁଙ୍କଠାରୁ** ମୋର ଜରୁରୀକାଳୀନ ପରିସ୍ଥିତି (ଶସ୍ୟହାନୀ, ଗୋସମ୍ପଦ ନଷ୍ଟ, ରୋଗ ଇତ୍ୟାଦି)ରେ ଟଙ୍କା **ଉପହାର** ପାଇବା ପାଇଁ ସକ୍ଷମ
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୯୫. ମୁଁ ଜଣେ **ସମ୍ପର୍କୀୟଙ୍କଠାରୁ** ମୋର ଜରୁରୀକାଳୀନ ପରିସ୍ଥିତି (ଶସ୍ୟହାନୀ, ଗୋସମ୍ପଦ ନଷ୍ଟ, ରୋଗ ଇତ୍ୟାଦି)ରେ **ଋଣ** ପାଇବା ପାଇଁ ସକ୍ଷମ
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୯୬. ମୁଁ ଜଣେ **ବନ୍ଧୁଙ୍କଠାରୁ** ମୋର ଜରୁରୀକାଳୀନ ପରିସ୍ଥିତି (ଶସ୍ୟହାନୀ, ଗୋସମ୍ପଦ ନଷ୍ଟ, ରୋଗ ଇତ୍ୟାଦି)ରେ **ଋଣ** ପାଇବା ପାଇଁ ସକ୍ଷମ
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୯୭. ମୁଁ ଜଣେ **ସମ୍ପର୍କୀୟଙ୍କୁ** ତାଙ୍କର ଜରୁରୀକାଳୀନ ପରିସ୍ଥିତି (ଶସ୍ୟହାନୀ, ଗୋସମ୍ପଦ ନଷ୍ଟ, ରୋଗ ଇତ୍ୟାଦି)ରେ ଟଙ୍କା **ଉପହାର** ଦେବାକୁ ରାଜି
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୯୮. ମୁଁ ଜଣେ **ବନ୍ଧୁଙ୍କୁ** ତାଙ୍କର ଜରୁରୀକାଳୀନ ପରିସ୍ଥିତି (ଶସ୍ୟହାନୀ, ଗୋସମ୍ପଦ ନଷ୍ଟ, ରୋଗ ଇତ୍ୟାଦି)ରେ ଟଙ୍କା **ଉପହାର** ଦେବାକୁ ରାଜି
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୯୯. ମୁଁ ଜଣେ **ସମ୍ପର୍କୀୟଙ୍କୁ** ତାଙ୍କର ଜରୁରୀକାଳୀନ ପରିସ୍ଥିତି (ଶସ୍ୟହାନୀ, ଗୋସମ୍ପଦ ନଷ୍ଟ, ରୋଗ ଇତ୍ୟାଦି)ରେ **ଋଣ** ଦେବାକୁ ରାଜି
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୦୦. ମୁଁ ଜଣେ **ବନ୍ଧୁଙ୍କୁ** ତାଙ୍କର ଜରୁରୀକାଳୀନ ପରିସ୍ଥିତି (ଶସ୍ୟହାନୀ, ଗୋସମ୍ପଦ ନଷ୍ଟ, ରୋଗ ଇତ୍ୟାଦି)ରେ **ଋଣ** ଦେବାକୁ ରାଜି
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୦୧. **ଜରୁରୀକାଳିନ ପରିସ୍ଥିତିରେ** ମୁଁ ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନଙ୍କୁ ଟଙ୍କା ଉପହାର ଅପେକ୍ଷା ଅତି କମ୍ ସୁଦ୍ଧ ହାରରେ ଋଣ ଦେବାକୁ ପସନ୍ଦକରେ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୦୨. **ଜରୁରୀକାଳିନ ପରିସ୍ଥିତିରେ** ମୁଁ ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନଙ୍କଠାରୁ ଟଙ୍କା ଉପହାର ଅପେକ୍ଷା ଅତି କମ୍ ସୁଦ୍ଧ ହାରରେ ଋଣ ଆଣିବାକୁ ପସନ୍ଦକରେ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୦୩. **ଜରୁରୀକାଳିନ ପରିସ୍ଥିତି ନଥିଲେ** ମୁଁ ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନଙ୍କୁ ଟଙ୍କା ଉପହାର ଅପେକ୍ଷା ଅତି କମ୍ ସୁଦ୍ଧ ହାରରେ ଋଣ ଦେବାକୁ ପସନ୍ଦକରେ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୦୪. **ଜରୁରୀକାଳିନ ପରିସ୍ଥିତି ନଥିଲେ ମଧ୍ୟ** ମୁଁ ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନଙ୍କଠାରୁ ଟଙ୍କା ଉପହାର ଅପେକ୍ଷା ଅତି କମ୍ ସୁଦ୍ଧ ହାରରେ ଋଣ ଆଣିବାକୁ ପସନ୍ଦକରେ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୦୫. ମୁଁ ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନଙ୍କର ଋଣ ପରିଶୋଧ କରିବାରେ ଖିଲାପ ନକରିବାକୁ ପସନ୍ଦ କରେ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୦୬. କେତେକ ଜରୁରୀକାଳିନ ପରିସ୍ଥିତି ଯୋଗୁଁ ଯେତେବେଳେ ମୁଁ ଋଣ ପରିଶୋଧ କରିବା ଅବସ୍ଥାରେ ନଥାଏ, ମୁଁ ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନଙ୍କୁ ଋଣ ପରିଶୋଧ କରିବାରେ ବିଳମ୍ବ କରିଥାଏ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୦୭. କେତେକ ଜରୁରୀକାଳିନ ପରିସ୍ଥିତି ଯୋଗୁଁ ଯେତେବେଳେ ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନେ ଋଣ ପରିଶୋଧ କରିବା ଅବସ୍ଥାରେ ନଥାଆନ୍ତି, ମୁଁ ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନଙ୍କୁ ବିଳମ୍ବରେ ଋଣ ପରିଶୋଧ କରିବାର ସୁଯୋଗ ଦେଇଥାଏ ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୦୮. କେତେକ ଜରୁରୀକାଳିନ ପରିସ୍ଥିତି ଯୋଗୁଁ ଯେତେବେଳେ ମୁଁ ଋଣ ପରିଶୋଧ କରିବା ଅବସ୍ଥାରେ ନଥାଏ, ମୁଁ ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନଙ୍କ ଋଣ ପରିଶୋଧ କରିବା ପାଇଁ ସୁଦ୍ଧ ହାର କମ କରାଇବାକୁ ସକ୍ଷମ ହୋଇଥାଏ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୦୯. କେତେକ ଜରୁରୀକାଳିନ ପରିସ୍ଥିତି ଯୋଗୁଁ ଯେତେବେଳେ ମୋର ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନେ ଋଣ ପରିଶୋଧ କରିବା ଅବସ୍ଥାରେ ନଥାଆନ୍ତି, ମୁଁ ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନଙ୍କୁ ଋଣ ପରିଶୋଧ କରିବା ପାଇଁ କମ୍ ସୁଦ୍ଧ ହାର କମ କରିଥାଏ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୧୦. ଯେତେ ଅଧିକା ପରିମାଣ ମୁଁ ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନଙ୍କୁ ଋଣ ଦେଇଥାଏ, ସେତେ ଅଧିକା ସେମାନେ ଋଣ ପରିଶୋଧରେ ଖିଲାପ କରିବାର ସମ୍ଭାବନା ଥାଏ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୧୧. ଗୋଷ୍ଠୀ / ଗ୍ରାମର ଚାପ ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନଙ୍କ ଭିତରେ ଋଣ ପରିଶୋଧରେ ସାହାଯ୍ୟ କରିଥାଏ ଓ ଋଣ ପରିଶୋଧ ଖିଲାପ କମାଇଥାଏ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୧୨. ଯେତେବେଳେ ମୋର ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନଙ୍କର ଆୟ ଅଧିକ ଥାଏ, ମୁଁ ସେମାନଙ୍କଠାରୁ ଋଣ ଆଣିବା ପାଇଁ ସକ୍ଷମ ହୋଇଥାଏ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୧୩. ମୁଁ ଯଦି ଆଗ ଋଣ ପରିଶୋଧ କରିଥାଏ, ତେବେ ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନଙ୍କଠାରୁ ଋଣ ଆଣିବା ମୋ ପାଇଁ ସହଜ ହୁଏ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୧୪. ଯଦି ମୋର ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟମାନେ ଆଗ ଋଣ ମୋତେ ପରିଶୋଧ କରିଥାଆନ୍ତି, ତେବେ ମୁଁ ସେମାନଙ୍କୁ ଋଣ ଦେବାପାଇଁ ରାଜି।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୧୫. ମୁଁ ମୋର ସେହି ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟଙ୍କୁ କମ୍ ସୁଦ୍ଧ ହାରରେ ଋଣ ଦେବାପାଇଁ ଅଧିକ ଇଚ୍ଛୁକ, ଯେଉଁମାନେ ମୋତେ ଧାର ଦେଇଥିଲେ/ଉପହାର ଦେଇଥିଲେ/ଆଗ ଟଙ୍କା ଫେରସ୍ତ କରିଥିଲେ, ଯଦିଓ ମୁଁ ଜାଣିଛି ସେ ସମ୍ପୂର୍ଣ୍ଣରୂପେ ଟଙ୍କା ଫେରସ୍ତ କରିବେ ନାହିଁ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୧୬. ମୁଁ ମୋର ସେହି ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟଙ୍କୁ ଏପରିକି ଅଧିକ ସୁଦ୍ଧ ହାରରେ ଋଣ ଦେବାପାଇଁ ଅନିଚ୍ଛୁକ, ଯେଉଁମାନେ ମୋତେ ଧାର /ଉପହାର /ଆଗ ଟଙ୍କା ଫେରସ୍ତ ଦେବା ପାଇଁ ମନା କରିଥିଲେ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୧୭. ଯଦି ମୁଁ ଆଗରୁ ଋଣ/ଉପହାର/ଆଗ ଟଙ୍କା ଫେରସ୍ତ ଦେବା ପାଇଁ ମନା କରିଥାଏ, ତେବେ ଉଚ୍ଚ ସୁଦ୍ଧହାର ଦେଲେ ମଧ୍ୟ ଜଣେ ବନ୍ଧୁ ଓ ସମ୍ପର୍କୀୟଠାରୁ ଋଣ ପାଇବାର ସମ୍ଭାବନା ନଥାଏ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୧୮. ଦାୟିତ୍ୱବୋଧ ଦୃଷ୍ଟିକୋଣ ଓ ଦାୟିତ୍ୱବୋଧ ଅଭିପ୍ରାୟ

''ଧରାଯାଉ ଜଣେ ସଜୋଟ ଅଜଣା ବ୍ୟକ୍ତି ଆପଣଙ୍କ ପାଖକୁ ଆସିଲେ ଏବଂ ଏକ ଜୁଆଖେଳ ଖେଳିବାକୁ କହିଲେ, ଯେଉଁଥିରେ ପଇସା ଗୁଳା ମାଧ୍ୟମରେ ଟଙ୍କା ମିଳେ। ଯଦି ପଇସାର ମୁଣ୍ଡପଟ ଉପରକୁ ପଡେ, ତେବେ ଆପଣ ପ୍ରଥମ ସ୍ତରରେ ଥିବା ପରିମାଣ ପାଇବେ ଓ ଯଦି ଲାଞ୍ଜପଟ ଉପରକୁ ପଡ଼େ, ତେବେ ଆପଣ ଦ୍ୱିତୀୟ ସ୍ତରରେ ଥିବା ପରିମାଣ ପାଇବେ। ପ୍ରତ୍ୟେକର ୫୦% ପଡ଼ିବାର ସମ୍ଭାବନା ରହିଛି। ଯଦି ଏହି ଖେଳଟି ବାରମ୍ବାର ପଇସାପକାଇ ପୁନରାବୃତ୍ତି କରାଯାଏ, ତେବେ ଆପଣ ତୃତୀୟସ୍ତରରେ ଥିବା ପରିମାଣ ପାଇବାକୁ ଆଶା କରିପାରନ୍ତି। ଯଦିଓ ପ୍ରଥମ ସ୍ତରର ପ୍ରାପ୍ୟ ପରିମାଣର ଅଯୌଗିକ ଦ୍ୱିତୀୟ ସ୍ତରର ଅଯୌଗିକ ସହ ସମାନ ଉଚ୍ଚ ଓ କମ୍ ମୂଲ୍ୟଗୁଡ଼ିକ ଅଲଗା। ଟେବୁଲ୍‌ରେ ଥିବା ୬ଟି ଜୁଆଖେଳ ଅଧ୍ୟୟନ କରନ୍ତୁ ଓ ସେଥିମଧ୍ୟରୁ **ଗୋଟିଏ** ଆପଣ ପସନ୍ଦ କରନ୍ତୁ।''

ପସନ୍ଦ	ସୌଭାଗ୍ୟର ଲାଭ (ଟଙ୍କାରେ): ୫୦% ସୁଯୋଗ	ଦୁର୍ଭାଗ୍ୟରୁ ଲାଭ (ଟଙ୍କାରେ): ୫୦% ସୁଯୋଗ	ଆଶା କରାଯାଉଥିବା ମୂଲ୍ୟ
୧	୫୦୦	୫୦୦	୫୦୦
୨	୯୫୦	୪୫୦	୭୦୦
୩	୧୨୦୦	୪୦୦	୮୦୦
୪	୧୫୦୦	୩୦୦	୯୦୦
୫	୧୯୦୦	୧୦୦	୧୦୦୦
୬	୨୦୦୦	୦	୧୦୦୦

ସ୍ୱାସ୍ଥ୍ୟବୀମା ସମ୍ବନ୍ଧୀୟ ପ୍ରଶ୍ନ

୧୧୯. ଆପଣଙ୍କ ପରିବାରର କୌଣସି ସଦସ୍ୟ (ଆପଣଙ୍କୁ ମିଶାଇ)ଙ୍କର କୌଣସି ପ୍ରକାରର ସ୍ୱାସ୍ଥ୍ୟବୀମା ଅଛି କି ?
ହଁ.....ନାହିଁ.....

କ. ଆପଣ କିପରି ଆପଣଙ୍କର ସ୍ୱାସ୍ଥ୍ୟ ଅବସ୍ଥା ଅଛି ବୋଲି ଭାବନ୍ତି
ଅତି ଉତ୍ତମ, ଉତ୍ତମ, ଠିକ୍ ଅଛି, ଭଲ ନାହିଁ

୧୨୦. ଯଦି ନାହିଁ, ସ୍ୱାସ୍ଥ୍ୟବୀମା ନଥିବାର କାରଣଗୁଡ଼ିକ କ'ଣ ?

କ. ସ୍ୱାସ୍ଥ୍ୟବୀମା ଓ ଏହାର ଉପକାରିତା ବିଷୟରେ ତଥ୍ୟର ଅଭାବ
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

ଖ. କୌଣସି ବୀମା ଯୋଗାଣକାରୀ (ସରକାରୀ ବା ବେସରକାରୀ) ମୋ ପାଖରେ ପହଞ୍ଚି ନାହାଁନ୍ତି।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ....।

ଗ. ଆର୍ଥିକ ସମ୍ବଳର ଅଭାବ/ମୁଁ ଦେଇପାରିବି ନାହିଁ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

ଘ. ବୀମା ଖର୍ଚ୍ଚ ତୁଳନାରେ ଏଥିରୁ ମିଳୁଥିବା ଉପକାରିତା ମୋ ପାଇଁ ନ୍ୟୁନ ଅଟେ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....।

୧୨୧. ଆପଣଙ୍କର ପରିବାର ସଦସ୍ୟ ଗତବର୍ଷ ହସ୍‌ପିଟାଲରେ (ଅତିରୋଗାକ୍ରାନ୍ତ) କେତେ ଦିନ ରହିଥିଲେ.....

୧୨୨. ମୋଟ କେତୋଟି ରୋଗ ଘଟଣା (ଶଯ୍ୟା ବିଶ୍ରାମ ଆବଶ୍ୟକ/ବିଦ୍ୟାଳୟ ବା କାର୍ଯ୍ୟକ୍ଷେତ୍ରରେ ଅନୁପସ୍ଥିତ) ଆପଣ ବା ଆପଣଙ୍କର ପରିବାରରେ ବିଗତ ୬ମାସରେ ଘଟିଅଛି.....(ସ୍ୱାସ୍ଥ୍ୟଅବନତି ଅନୁପାତ: ବିଗତ ୬ମାସରେ ସ୍ୱାସ୍ଥ୍ୟ ଖରାପ ଘଟଣାର ସଂଖ୍ୟାକୁ ପରିବାର ସଦସ୍ୟମାନଙ୍କ ଦ୍ୱାରା ବିଭାଜନ)

କ. ଗତ ୧ ବର୍ଷ ଭିତରେ ଆପଣ କେତେ ଥର ବିଭିନ୍ନ ପ୍ରକାର ଡାକ୍ତର ପାଖକୁ ପରାମର୍ଶ ପାଇଁ ଯାଇଛନ୍ତି ।

୧୨୩. ଆପାତଃତ ଗତବର୍ଷ ଡାକ୍ତରଙ୍କ ପାଖରେ ବା ହସ୍‌ପିଟାଲରେ ଆପଣଙ୍କ ପରିବାରର ମୋଟ କେତେ ଖର୍ଚ୍ଚ ହୋଇଛି.....

୧୨୪. ଆପାତଃତ ଗତବର୍ଷ ଆପଣଙ୍କ ପରିବାରର ମୋଟ କେତେ ଖର୍ଚ୍ଚ ଔଷଧରେ ହୋଇଛି.....

୧୨୫. ଆପାତଃତ କୌଣସି ଏକ ବଡ଼ ରୋଗପାଇଁ ହସ୍‌ପିଟାଲରେ ରହିବାରେ ଆପଣଙ୍କ ପରିବାରର ମୋଟ କେତେ ଟଙ୍କା ଖର୍ଚ୍ଚ ହୋଇଛି.....

୧୨୬. ଆପାତଃତ ଆପଣଙ୍କ ପରିବାରର କୌଣସି ଗର୍ଭବତୀ ବା ଶିଶୁ ଜନ୍ମ ବାବଦରେ ମୋଟ କେତେ ଖର୍ଚ୍ଚ ହୋଇଛି.....।

୧୨୭. ଆପଣଙ୍କ ହିସାବରେ ଗତବର୍ଷ ଆପଣଙ୍କ ପରିବାରରେ ଦେହଖରାପ ଘଟଣା ଯୋଗୁଁ କେତେ ଆୟ ଆପଣ ହରାଇଛନ୍ତି(ମଜୁରୀ, କୃଷିକ୍ଷେତ୍ର ଇତ୍ୟାଦିରୁ).....।

୧୨୮. ଧରାଯାଉ ଆପଣଙ୍କ ସ୍ୱାସ୍ଥ୍ୟ ଖର୍ଚ୍ଚର ଦାୟିତ୍ୱ ବହନକରିବା ପାଇଁ ଆପଣଙ୍କୁ ନିବେଶ (ବାର୍ଷିକ ଦେୟ) କରିବାର ସୁଯୋଗ ଦିଆଗଲେ, ଆପଣ ଆପଣଙ୍କ ବାର୍ଷିକ ଆୟର କେତେଭାଗ ତ୍ୟାଗ କରିବା ପାଇଁ ରାଜି ଅଛନ୍ତି ? (ଦୟାକରି ସବୁଠାରୁ ପ୍ରଯୁଜ୍ୟ ପ୍ରତିଶତକୁ ଗୋଲେଇ ଦ୍ୱାରା ଚିହ୍ନଟ କରନ୍ତୁ)

୦% ୨% ୫% ୭% ୧୦% ୧୫% ୨୦% ୨୫% ୨୫%ରୁ ଅଧିକ

୧୨୯. ଆପଣଙ୍କର କୌଣସି ପ୍ରକାର ସ୍ୱାସ୍ଥ୍ୟବୀମା ପାଇନାହାଁନ୍ତି ବୋଲି ଯଦି ଧରି ନିଆଯାଏ, ତେବେ ଦୟାକରି ଦର୍ଶାଅ ଯେ, କେଉଁ ପ୍ରକାର ସ୍ୱାସ୍ଥ୍ୟ ଖର୍ଚ୍ଚ ପାଇଁ ଆପଣ ବୀମା କରିବାକୁ ଇଚ୍ଛା କରନ୍ତି ।

କ. ଯନ୍ତ୍ରଣାଦାୟକ ରୋଗ (ଅଦୃଶ୍ୟ ଓ ଅନିର୍ବାଯ୍ୟ ସ୍ୱାସ୍ଥ୍ୟ ଖର୍ଚ୍ଚ)
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ..... ।

ଖ. ସ୍ଥାୟୀ ଦେହଖରାପ (ଅଦୃଶ୍ୟ ଓ ଅବିରତ ଖର୍ଚ୍ଚ, ଡାଇବେଟିସ୍ ଇତ୍ୟାଦି ଭଳି)
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ..... ।

ଗ. ଅନ୍ୟାନ୍ୟ ନିୟମିତ ରୋଗ
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ..... ।

ଘ. ପ୍ରମୁଖ ରୋଗ ବା ଅସ୍ତ୍ରୋପଚାର ପାଇଁ ହସ୍‌ପିଟାଲଭର୍ତ୍ତି ଖର୍ଚ୍ଚ
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ..... ।

ଙ. ଗର୍ଭବତୀ ଓ ପିଲାଜନ୍ମ ଖର୍ଚ୍ଚ
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ..... ।

ଚ. ଦୁର୍ଘଟଣା ଓ ଅକର୍ମଣ୍ୟ ପାଇଁ ବୀମା

ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ..... ।

୧୩୦. ନିମ୍ନଲିଖିତଗୁଡ଼ିକ ମଧ୍ୟରୁ କେଉଁଟି ଭଲ ବୀମା ସୁଯୋଗ ଯୋଗାଇ ପାରିବ ? ଦୟାକରି ଗୋଟିଏ ବାଛନ୍ତୁ ।

କ. ସରକାର ସାର୍ବଜନୀନ ସ୍ୱାସ୍ଥ୍ୟବୀମା ଯୋଗାଇବା ଉଚିତ୍ ଓ ବିନା ଖର୍ଚ୍ଚରେ ଏହା ସମସ୍ତଙ୍କୁ ଉପଲବ୍ଧ ହେଉଥିବ ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ..... ।

ଖ. ସରକାର ସାର୍ବଜନୀନ ସ୍ୱାସ୍ଥ୍ୟବୀମା ଯୋଗାଇବା ଉଚିତ୍ ଓ କିଛି ଖର୍ଚ୍ଚରେ ଏହା ସମସ୍ତଙ୍କୁ ଉପଲବ୍ଧ ହେଉଥିବ ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ..... ।

ଗ. ବେସରକାରୀ ବୀମା ନିଗମଗୁଡ଼ିକ ସମସ୍ତଙ୍କୁ ଖର୍ଚ୍ଚ ଭିତ୍ତିରେ ସ୍ୱାସ୍ଥ୍ୟବୀମା ଯୋଗାଇ ଦେବା ଉଚିତ୍ ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ..... ।

ଘ. ବେସରକାରୀ ଡାକ୍ତରଖାନାଗୁଡ଼ିକରେ ସରକାରୀ ଡାକ୍ତରଖାନା ଅପେକ୍ଷା ଅଧିକ ଭଲ ସ୍ୱାସ୍ଥ୍ୟ ସୁଯୋଗ ଅଛି (ଥାଇପାରେ) ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ.....

ଙ. ଦେଶରେ ଦ୍ୱି-ସ୍ତରୀୟ ସ୍ୱାସ୍ଥ୍ୟ ବ୍ୟବସ୍ଥା ରହିବା ଆବଶ୍ୟକ, ଗୋଟିଏ ସ୍ତରରେ ବେସରକାରୀ ଡାକ୍ତରଖାନା ସେବା ସେହିମାନଙ୍କୁ ଉପଲବ୍ଧ ହେବ ଯେଉଁମାନେ ବେସରକାରୀ ସ୍ୱାସ୍ଥ୍ୟବୀମା ଖର୍ଚ୍ଚ ଦେଇପାରୁଥିବେ ଏବଂ ଦ୍ୱିତୀୟସ୍ତରରେ ସରକାରୀ ଡାକ୍ତରଖାନାର ସେବା ସେହିମାନଙ୍କୁ ଉପଲବ୍ଧ ହେଉଥିବ, ଯେଉଁମାନେ ସ୍ୱାସ୍ଥ୍ୟବୀମା ଖର୍ଚ୍ଚ ଦେଇପାରୁନଥିବେ ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ..... ।

ଚ. ଗ୍ରାମ୍ୟ ଋଣ ସମବାୟ ବା କ୍ଷୁଦ୍ର ବିତ୍ତ ଅନୁଷ୍ଠାନଗୁଡ଼ିକ ଭଳି ଅନ୍ୟାନ୍ୟ ସଂସ୍ଥା ସ୍ୱାସ୍ଥ୍ୟବୀମା ଯୋଗାଇବା ଉଚିତ୍ ।
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ..... ।

୧୩୧. ଆପଣ କ'ଣ ଭାବୁଛନ୍ତି ଯେ, ଆପଣଙ୍କ ଗ୍ରାମର ପ୍ରତ୍ୟେକ ପରିବାର ଯଥେଷ୍ଟ ସ୍ୱାସ୍ଥ୍ୟବୀମା କିଣିବା ଉଚିତ୍ ?
ସମ୍ପୂର୍ଣ୍ଣ ରାଜି.....,ସାମାନ୍ୟରାଜି.....,ରାଜି.....,ଅରାଜି....., ଆଦୌରାଜି ନୁହେଁ..... ।